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Original Articles

THE USE OF THE TWIN-WIRE MECHANISM IN THE TREATMENT OF DEEP OVERBITES

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BEFORE taking up the subject of the treatment of the deep overbites with the twin-wire mechanism I shall show you some instruments I use to measure the extent of, and the direction in which I move the teeth with this appliance.

Of course, before we can make a measurement we must have a definite point to which to measure. It is extremely difficult to make marks on the living subject and to duplicate them later. So, if we can eliminate the making of such marks our results will be more accurate.

It is essential that we have four definite points or marks: two eye and two ear points. The eye points are easily and accurately obtained by merely having the subject close the eyes, and using the points at the inner canthus of the eye, Fig. 1*A*. It is not necessary to mark them. Later when we wish to make our second measurements, all that is required is to have the patient close the eyes, and then and there we have our eye points exactly as they were originally.

To find a point on the ear was a much more difficult problem. After trying different methods, I finally hit upon the idea of taking plaster impression of the inside of the ear, thus getting plaster plugs of the ear, as shown in Fig. 1*B*. The technique of making these ear-plugs is as follows: Place a pledget of cotton in the external auditory meatus to prevent the plaster from going in too far and injuring the eardrum. The chair is then tipped back so that the patient is in a reclining position and the head turned on the side so the plaster cannot run out. Then a small mix of thin plaster is poured into the ear and the ear gently moved about to permit the plaster to fill all the inner parts of the ear. When it hardens, the cast is peeled out of the ear and, with a knife, and sand paper, the outer surface is smoothed down flush

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with the tragus. The ear-plug is then replaced in the ear and, with a sharp pointed wire, a dot is made in it ⅛ of an inch back of the tragus notch. We now have a definite ear mark to measure to. Furthermore, any time in the future this ear-plug can be replaced in the ear, the point remaining the same as it was when first made.

If the plug is thoroughly shellacked after it is made, practically no shrinkage takes place in it. I believe this ear-plug method is the most accurate way yet found to procure a definite ear mark.

After making a hundred or more sets of these ear-plugs, I was impressed with the variation in the size, shape and position of the ear, and especially the tragus. I believe it is one of the most variable points on the head. The impracticability of using it as a landmark in diagnosis was impressed upon me.

Fig. 1*C* shows the calipers used to measure from the inner canthus of the eye to the incisal edge of the anterior teeth. They are a regular hardware store calipers with the incisal and eye pieces added. The incisal beak has a shallow groove in it, into which the incisal edge of the tooth rests. The eye-piece is round and trimmed into a sharp point. The calipers are graduated in sixty-fourths of an inch. I find I can duplicate a measurement with never more than a sixty-fourth of an inch variation, and, when I am very careful, I can duplicate the measurements accurately, time after time, Fig. 2*C*.

I worked out this incisal-to-canthus measurement to determine: First, if I unintentionally elongated the incisors in treating a distoclusion, or if it was done in moving the first molar distally. Second, if I could depress or elongate anterior teeth when I wished to do so.

I also worked out a molar-to-ear measurement, to determine whether or not I could move a molar distally, and to measure the extent to which it has been accomplished. Briefly, this is the way I do it: The twin-arch is removed and a 0.036-inch bar is inserted into the buccal tube on the molar band. It has a stop on it which causes it to protrude from the tube one inch, Fig. 2*A*. I use an inch-length in order to avoid stretching the lips while the measurement is being made. I use a modified Brown and Sharp sliding calipers graduated to one-hundredth of an inch, as shown in Fig. 1*D*.

The beak of the calipers, which has a small hole in it, is placed over the end of the bar, and the slide, with the sharp pointed beak, is moved along until it is on the dot of the ear-plug, as shown in Fig. 2*D*. In this way the distance from the end of the buccal tube on the molar band to a point on the ear-plug is accurately measured.

Later, when I shall speak of moving a molar distally, please bear in mind that I am not guessing at anything but have made accurate measurements of such movements.

Fig. 2*B* shows the instrument I use to measure the vertical height of the mandible from the occlusal surface of the mandibular molar to the lower border of the mandible. My object in designing this measuring device was to have an instrument with which to discover whether or not I increase the distance from the lower border of the mandible to the occlusal surface of the first molar in the treatment of deep overbite and other forms of malocclusion; in other words, to discover if I have caused vertical development in this region.

The bar *A* in Fig. 2*B* has a loop on each side so that when the midsection rests in the buccal grooves of the molar it will not stretch the corners of the mouth. The midsection of bar *A* is triangular. This permits the V-shape to rest more firmly in the mesiobuccal grooves of the mandibular molars.

Fig. 1.

Parallel to bar *A* is a flat bar, *B*, one-half inch wide, which fits under the mandible. It slides up and down on the upright bars *C* and *D*. The coil springs on the upright bars *C* and *D* press the flat bar *B* against the soft tissues under the mandible, when the device is placed in the mouth, Fig. 2*E*. Bars *C* and *D* are threaded so that the springs can be equalized on different sized mandibles. I adjust them so that each spring exerts four pounds of pressure. This amount of pressure compresses the soft tissues and makes it possible to duplicate the measurement.

I have found this instrument very accurate and can measure quickly and accurately any change in the vertical development of the mandible in the molar region.

Deep overbite is usually caused by a lack of vertical development in the molar and premolar region of the maxillary and mandibular arches. It also may be caused by a supraversion of either the anterior mandibular or the maxillary teeth. We may have cases where all these conditions are present.

It is difficult to distinguish between a supraclusion of the anterior teeth and a lack of vertical development in the molar region.

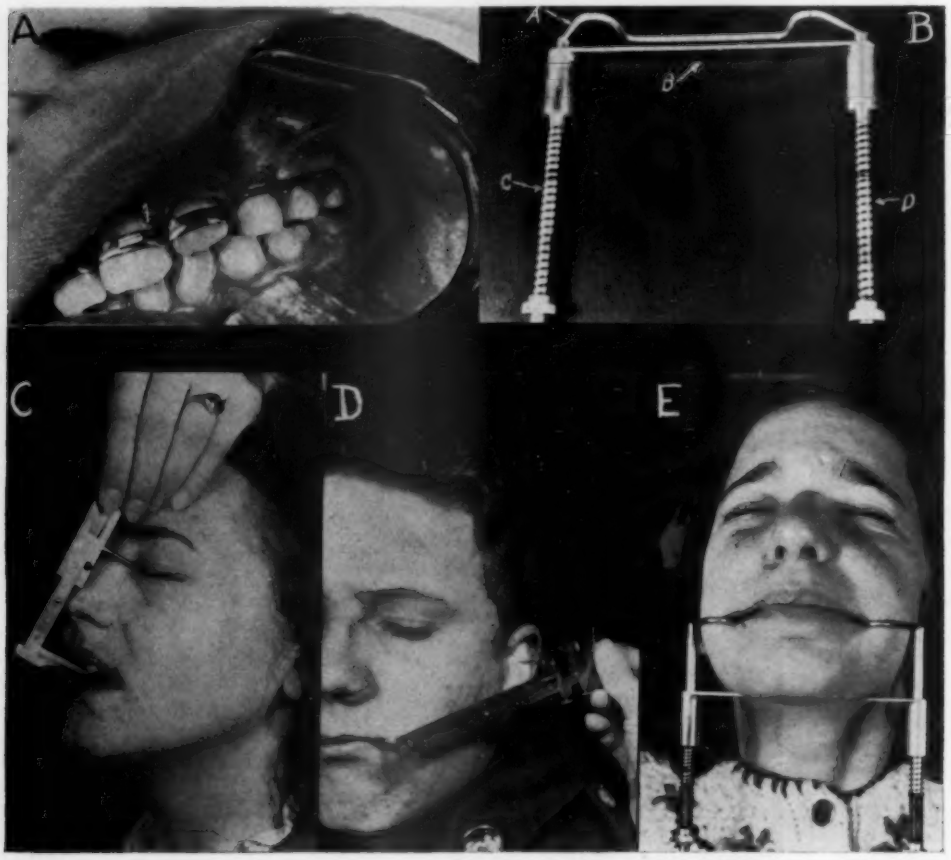

Fig. 2.

I had thought, at the time I designed the measuring instruments here shown, that I might measure a sufficient number of patients to get an average norm for the male and female at definite ages. But I soon discarded that idea, for I found in my practice too great a variation in normal children and too few normal children to measure. After considerable study and experiment I concluded that the most satisfactory way to determine the cause of deep overbite is to place a block of wood between the molar teeth so that the block opens the bite to a normal position, as in Fig. 3 *D* and *E*. If this lengthening of the face improves the appearance of the child, Fig. 3 *A* and *B*, it is a very good indication that if we elongate the molars we will get the desired results.

Fig. 3 *C* and *F* show this case after ten months of treatment. Please notice how the face has been lengthened in Fig. 3*C* when the bite is opened, Fig. 3*F*.

In running through my cases, I observe that where I used this procedure about 95 per cent of them are improved in facial appearance.

We may find a deep overbite in any type of malocclusion. However, it is far more prevalent in distoclusion than in any other types, and therefore I shall show you my method of treating distoclusion with the twin-wire mechanism and how, by this method, I correct the distoclusion and the deep overbite at the same time.

Fig. 4 shows the models of a girl 12 years of age with a bilateral distoclusion having a deep overbite. The front views show that the mandibular teeth are biting into the soft tissues of the palate. The side views illustrate the lack of development in the mandible. Notice how the mandibular premolars are biting lingually to the maxillary.

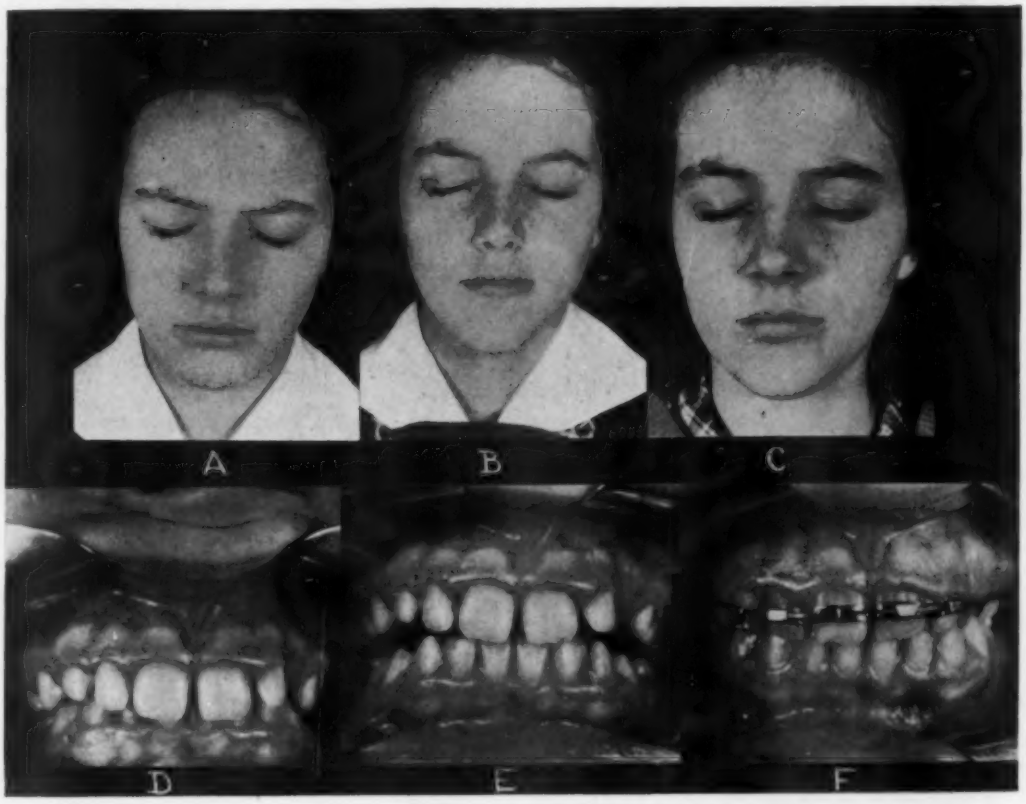

Fig. 3.

Fig. 5 is the same patient shortly after retention was begun.

Fig. 6*A* shows the twin-wire appliances on this patient. I have banded the four anterior maxillary teeth. The tubes on the molar bands have been soldered, so that the twin-wire arch lies to the gingival of the bands before it is sprung down and locked into place. The lateral incisors need to be depressed, and therefore I place these bands so that when the treatment is finished, the maxillary lateral incisors will lie in a normal relation to the central ones.

It is extremely important that the buccal tubes be soldered to the molar bands on each side so that when the arch is placed in the buccal tubes it lies in a single plane.

While the maxillary premolars were biting buccally to those in the mandible it was still necessary to widen the maxillary premolars. In this case the right lateral is so badly rotated that it is not advisable to seat the twin-wire arch in the lateral lock, and therefore it is ligated to the arch by doubling a 0.009-inch wire and passing the wire through the lock, as shown in the left view, Fig. 6*A*. In the lower arch I placed what I call a staple lingual arch. Later in this paper I shall describe the tubular arch used in the maxillary arch, also the staple lingual arch used in the mandibular.

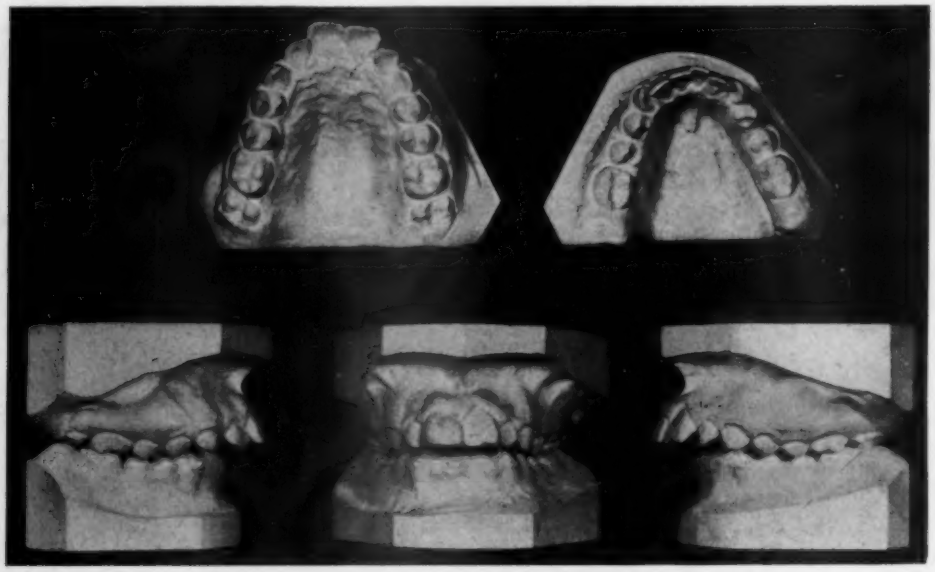

Fig. 4.

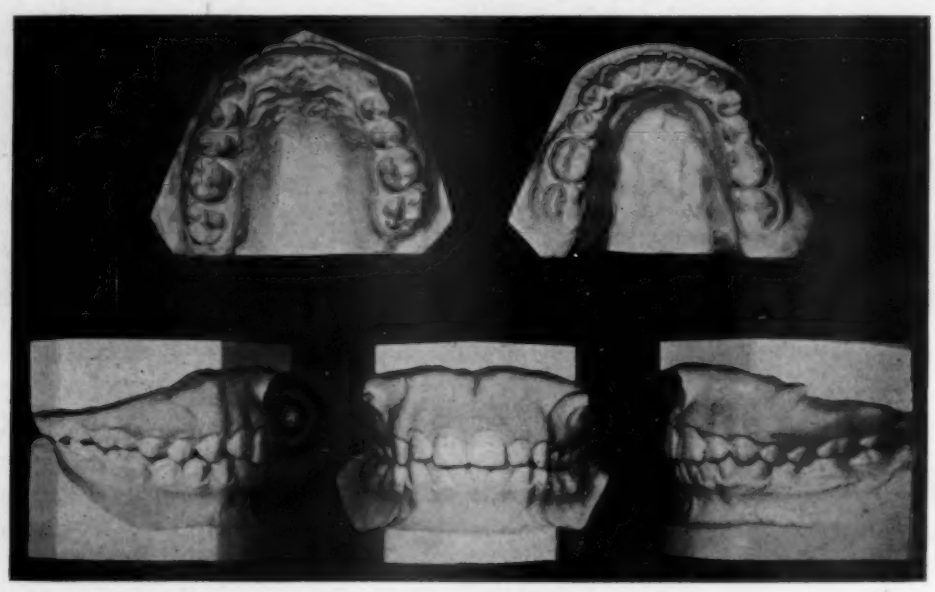

Fig. 5.

You will notice that there are no intermaxillary hooks on the maxillary twin-arch, Fig. 6*A*. In extreme cases of distoclusion, I have found it more

satisfactory not to start immediately with intermaxillary rubbers, but to line up the anterior teeth to some extent before the intermaxillary rubbers are worn.

Fig. 6*B* shows this case after it had been worked four months. Please notice how the lateral incisors have been shortened and rotated and how the lower arch has been expanded. The deep overbite is being corrected. We have developed a normal mesiodistal relation of the molar and premolar. At this stage I place coil springs over the end tubes of the maxillary twin-arch to move the maxillary molars distally, Fig. 6*C*.

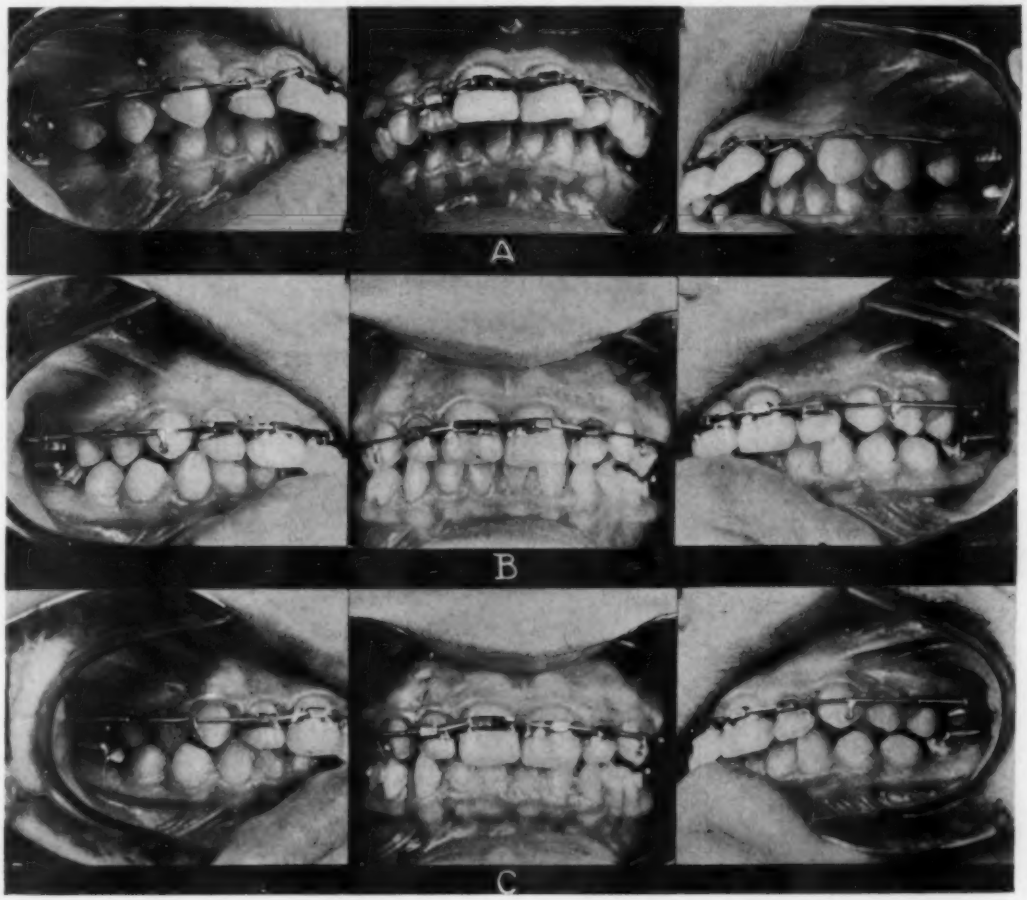

Fig. 6.

I use a 0.009-inch hard stainless 8-18 wire for my end tube coil springs. I have found a one-half inch coil spring is the best length for beginners. A spring of that length, when compressed $\frac{1}{32}$ of an inch, will exert a force of $1\frac{1}{2}$ ounces. At the end of two weeks another $\frac{1}{32}$ of an inch is compressed. Thus the spring is compressed $\frac{1}{16}$ of an inch, which exerts a pressure of three ounces on the molar tube. This is enough force to start the molar moving distally, and at each appointment the coil can be compressed another $\frac{1}{32}$ of an inch until the molars have been moved back the desired distance.

It is not necessary to remove the twin-arch to compress the coil spring. I use a sharp-nosed plier, preferably the Young plier, to flatten the end tube

in front of the coil. This flattening of the end tube makes a good stop and eliminates the necessity of removing the arch.

The coil springs in the midsection, which are placed between the intermaxillary hook and the lock on the lateral incisor, are used to prevent the anterior teeth sliding on the twin wires and becoming separated.

Fig. 7A shows this case with the molars moved farther distally than necessary. In all of my cases of distoclusion I overwork them. In other words, I move the maxillary molars and premolars farther distally than necessary.

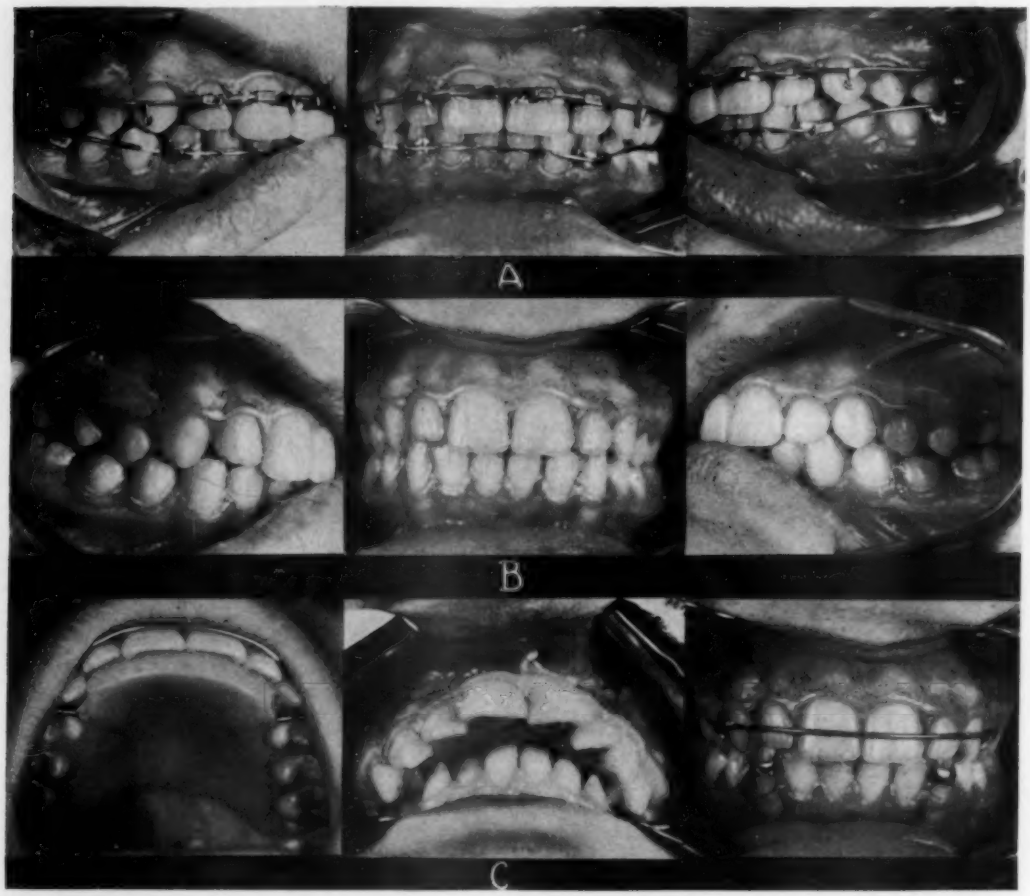

Fig. 7.

When the maxillary molars have been moved distally, until the mesiobuccal cusp is about $\frac{1}{32}$ of an inch back of the buccal groove of the mandibular molar, I remove the coil-springs, pinch a stop in the twin-wire arch just in front of the buccal tubes with a Young plier and let the child wear rubbers at night. If, after about two months, the teeth have remained in a normal relation I replace the twin-wire arch by one that does not have hooks. I dent the buccal tube with the Young plier so that the end tube of the twin-arch binds in it. This is very easily done with a tube, but almost impossible with a solid bar. The patient is allowed to wear this passive retention for about two months. If the teeth have remained in normal occlusion, all of the upper appliance is then removed, and the patient is given a Hawley plate with an inclined plane built into it, Fig. 7*C*.

Fig. 7*B* shows the patient when all of the twin-wire appliances were removed. It illustrates very clearly that the molars have been moved distally farther than normal. Referring to Fig. 5, you can see how they are beginning to assume their normal position again. This is accomplished by trimming the acrylic plate mesial to the molars. This overworking the molars has two objectives: First, it elongates the molars which assist in opening the bite. Second, it gives the premolars ample room to grow down and lock the mesio-distal relation of the arches.

Fig. 8 shows photographs of the child at the beginning of treatment and when retention was begun.

Now, let us see what I have done to open the bite in this case. My incisal to canthus measurement shows that I have elongated the anterior teeth $\frac{1}{32}$ of an inch. This was done in spite of the fact that the twin-arch was always made to lie against the gingival of the locks before it was locked in place. This gain in length is due to the downward pull of the intermaxillary rubbers.

My mandibular measurement shows an increase in growth from the lower border of the mandible to the occlusal surface of the first molar to be $\frac{1}{16}$ of an inch. The molar-to-ear measurement shows that I have moved the maxillary molar distally approximately $\frac{1}{16}$ of an inch and the mandibular molar forward $\frac{3}{32}$ of an inch.

Fig. 8.

I am also certain that I have moved the maxillary molar downward. It is impossible for me to measure this downward movement, but Fig. 9 illustrates very definitely that, when pressure is exerted against the maxillary molar to move it distally, it is elongated.

The side views, Fig. 9*B*, show the appliance which was used to gain space for the cuspid. I placed coil springs over the end tubes which exerted two ounces of pressure. This moved the anterior teeth forward and at the same time caused an open-bite.

Now my incisal-to-canthus measurement shows that there has been an increase of $\frac{1}{64}$ of an inch in this measurement. Because the lower lingual appliance was cemented in a passive state, the measurement from the lower border of the mandible to the occlusal surface of the mandibular molars shows no increase. I think this is definite proof that the maxillary molars are elongated when pressure is exerted against them.

When we use intermaxillary rubbers, as in the treatment of distoclusion cases, I am certain that I get much more elongation of the molars by my method of treatment.

Before continuing my description of the treatment of deep overbites, I shall describe the technique of making and manipulating the tubular lingual arch. A soft copper wire is shaped to the model to obtain the length of tube desired, Fig. 10*A*. Then a tube 0.036 of an inch outside diameter and 0.020 of an inch inside diameter is cut the length of this copper wire. A 0.020 of an inch wire is forced into the middle of this tubing. This wire is placed in the tube to reenforce the anterior portion of the tube, making the tube as stiff as a solid bar.

To make a finger-spring, a 0.020 of an inch wire is bent on itself, and the end is turned up and inward, as shown by the two wires in Fig. 10 *A* and *B*. This is done to prevent the finger-spring from rotating in the tube.

After the tubular lingual arch has been conformed to the model, in the usual way, it is soldered to the molar bands and then broken from the model and polished. After the body wire has been polished, the finger-spring is slipped into the distal end of the tube and brought forward and wrapped around the tube just in front of the soldered joint. This prevents it from slipping out of the tube, Fig. 10*B*.

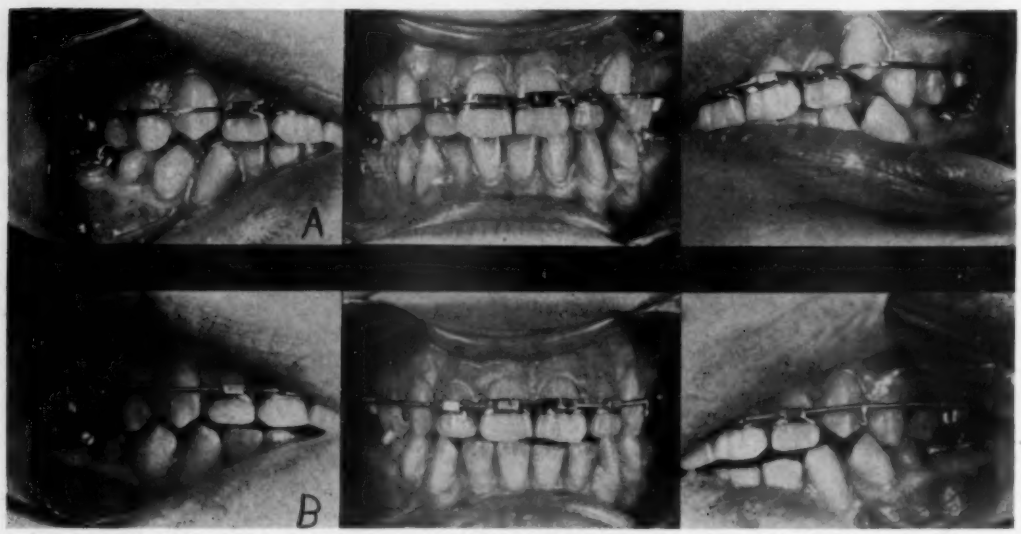

Fig. 9.

The tubular lingual arch has the following advantages over the removable arch:

1. It is much more easily and quickly made.

2. We have a smooth surface where the tube is soldered to the molar band, with no irritation to tongue or gingival tissue.

3. The arch is more stable, and there is no play in it, as is the case with removable lingual appliances.

4. With this tubular lingual arch I have a finger-spring which is not welded or soldered to the body wire, and consequently has a greater amount

of resiliency and is practically unbreakable. This tubular lingual arch can be raised from the teeth in the same manner as the solid steel bar and adjustment made to the finger-springs, and then rebent to position without any disturbance of the molar anchorage.

Fig. 10 *C, D,* and *E* shows the arch in the mouth. Note, in the illustration at the right, the amount of expansion that has been gained.

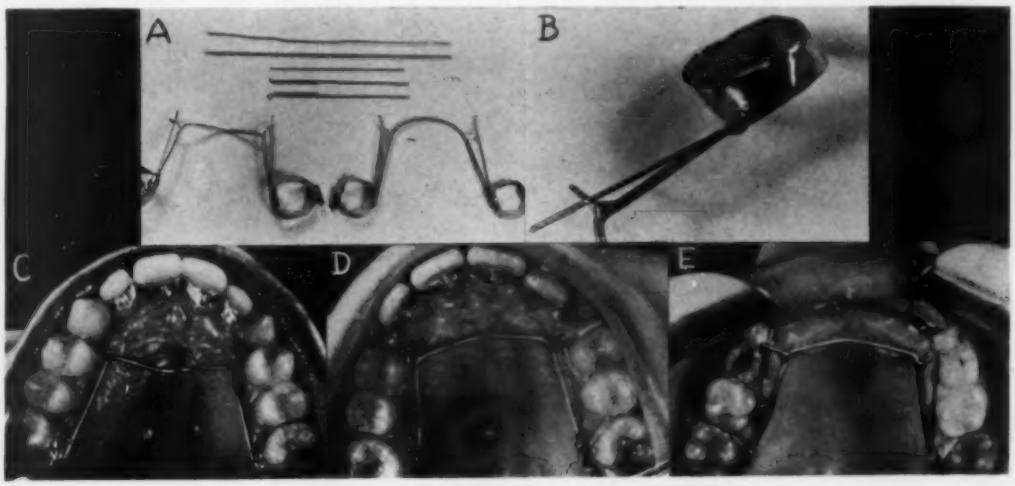

Fig. 10.

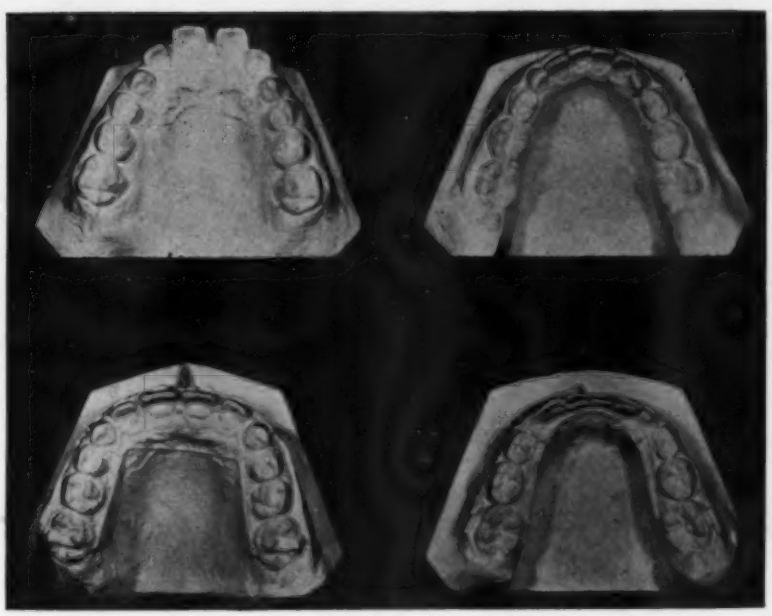

Fig. 11.

Fig. 11 is a very good example of the efficiency of the arch. This case has been under treatment for four months.

I have been using this tubular lingual arch on all of my cases during the past four years and have found it so satisfactory when I am using finger-springs that I have entirely discontinued the use of the removable lingual arch.

Another form of lingual appliance that I am using, which gives me much satisfaction, especially in those cases where I need a lot of expansion in the premolar region, is what I call, for the lack of a better name, the staple lingual arch.

In this arch I use a solid steel bar of 0.036-inch soldered to the molar bands, Fig. 12. Then I solder a piece of 0.020-inch steel wire under the body wire just back of the central incisors and bend it to the shape and size that I desire to

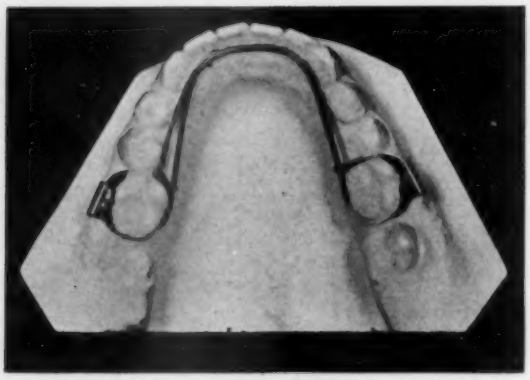

Fig. 12.

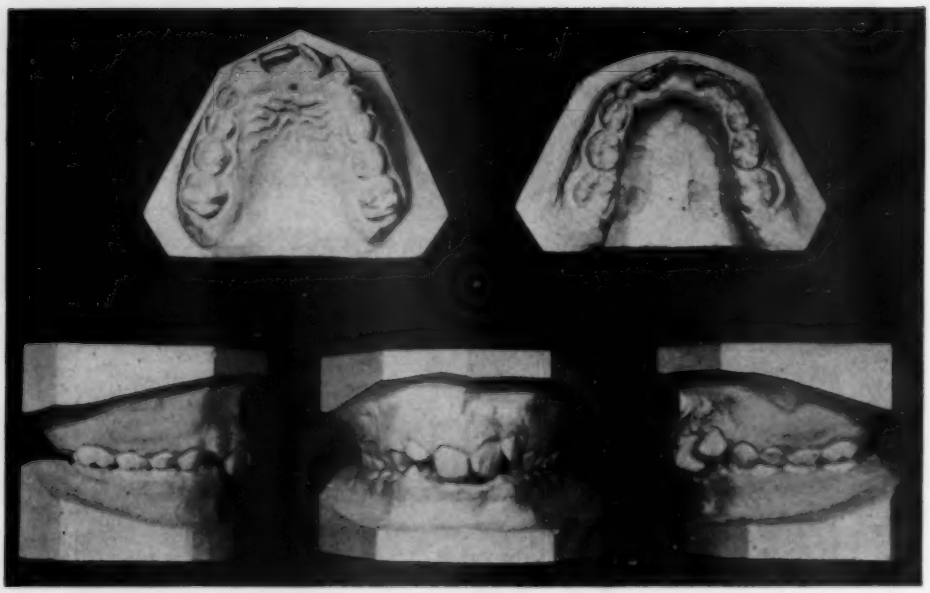

Fig. 13.

make my dental arch. A staple is soldered on each side of the lingual bar so that each staple lies in the embrasure between the first molar and second premolar. The lower part of the staple is cut off until it extends about $\frac{3}{64}$ of an inch beyond the bar. This is done so it will not impinge on the interproximal tissue. The top of the staple prevents the finger-spring from being displaced by the force of mastication, while the bottom flange of the staple forms a slot which engages the finger-spring and prevents it from sticking into the tongue.

What is the advantage of this type over the usual form of finger-spring? I have found it is extremely superior where it is necessary to obtain an unusual amount of expansion in the premolar region, as in Figs. 4 and 5. The finger, being a long lever, exerts a gentle force on these teeth, and all the expansion necessary to move them can be put in the arch when the bands are cemented to the molar teeth.

To impress upon you the simplicity of the treatment of distoclusion with the twin-wire arch and its correction of deep overbite, I shall present another case of a boy, 10 years old, with oral photographs that were taken approximately every three months during treatment. Fig. 13 shows the front and side views of this case. It is a bilateral distoclusion with the mandibular teeth biting into the soft tissues of the palate.

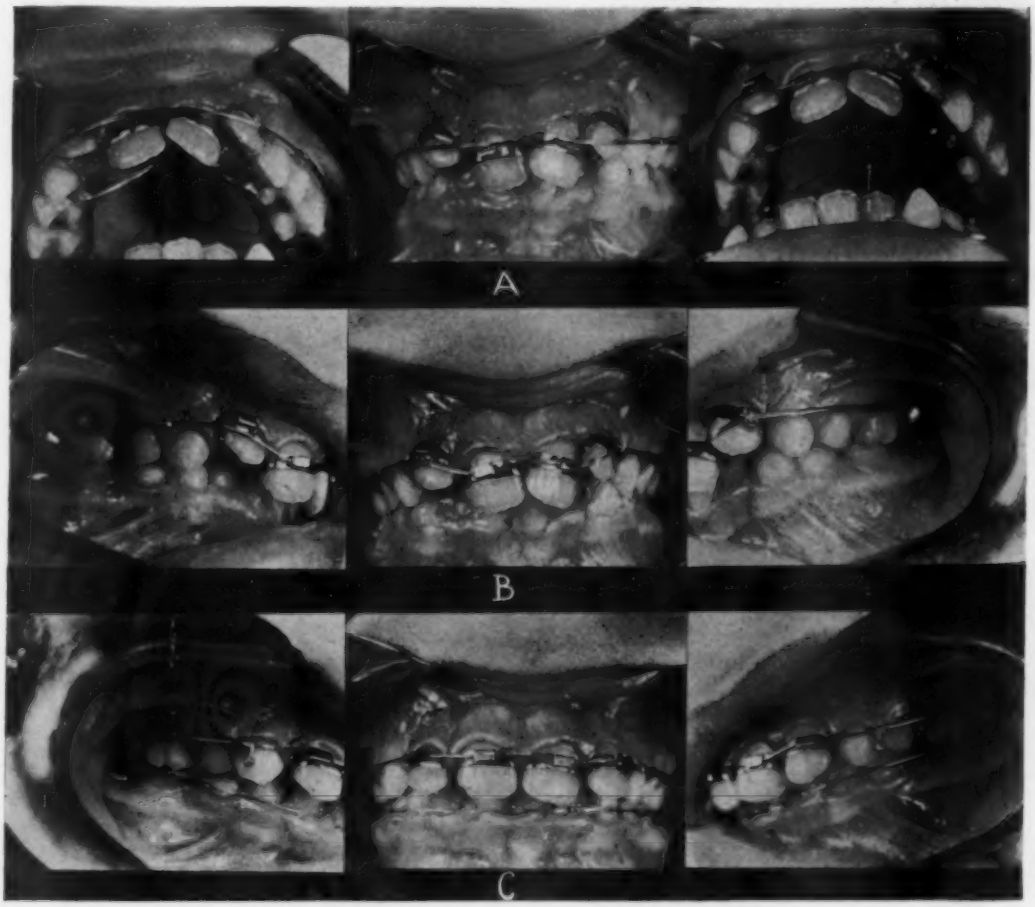

Fig. 14.

Fig. 14*A* shows that I have placed four bands on the four maxillary incisors. In this case I soldered the buccal tubes so that the twin-wire arch would lie to the gingival of the locks on the central incisors because, as you can see, the central ones need to be depressed and the lateral ones need to be elongated. The lateral incisors were so short that an 0.010 wire ligature was passed through the locks and ligated to the twin arch, Fig. 14*B*. When they had been moved down sufficiently the ligatures were removed, and the teeth locked to the twin

arch in the usual way, Fig. 14*C*. Fixed tubular lingual arches were placed in both the maxillary and mandibular arches to gain expansion.

I usually place a twin arch without hooks the first time, for I do not start the wearing of the intermaxillary rubbers in these cases for about four weeks. The time for the placing of the rubbers depends on the irregularity of the maxillary anterior teeth. This case was started with rubbers which had a pull of three ounces, and at the end of a month five-ounce rubbers were substituted for the former.

Fig. 15.

Fig. 16.

Fig. 14*C* shows the case at the end of four months. Please notice how the twin arch has depressed the maxillary central and elongated the lateral incisors. How do I know I have depressed the central and elongated the lateral incisors? It is very simple. I measure from the incisal edge of the incisors to the inner canthus of the eye, with the calipers shown in Fig. 2*C*.

You will notice that I have an almost normal mesiodistal relation and that the bite is now opening nicely. After the mandibular arch had been expanded enough, a twin arch was adjusted to it and the anterior teeth moved forward into alignment. After this movement had been accomplished, a soldered lingual arch was substituted and used as a retainer, Fig. 15*A*.

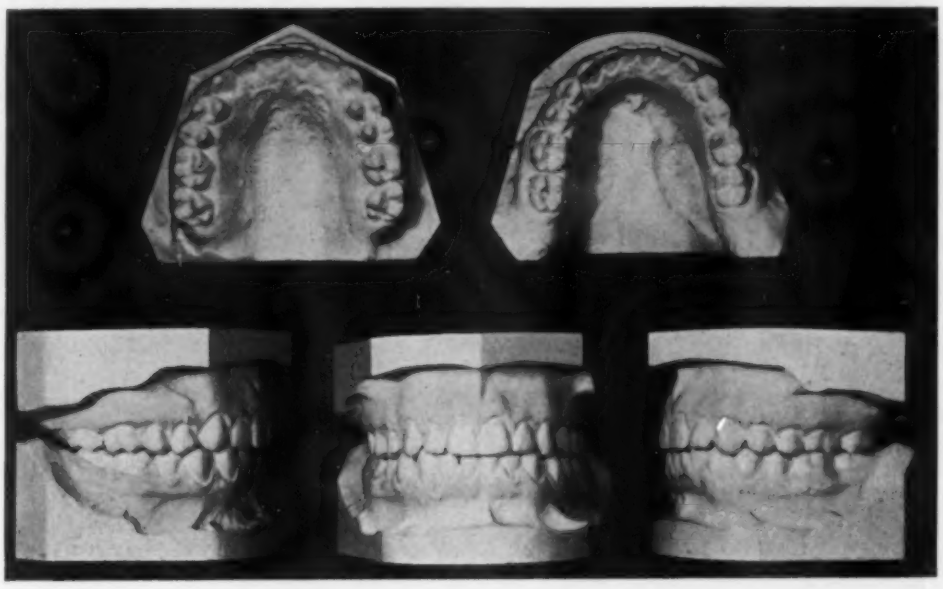

Fig. 17.

Fig. 18.

Since I now have the mandibular incisors almost striking against the lingual of the maxillary, I place coil springs over the end tubes of the maxillary arch and at this time start the moving of the maxillary molars distally, as previously described.

Fig. 15*A* shows the case after nine months of treatment with coil springs over the end tubes still in place.

Fig. 15*B* shows the case at the end of eleven months. The twin-wire arch has been removed and a Hawley retainer substituted in the maxillary arch. The mandibular arch is being retained with a soldered lingual arch, as previously mentioned.

Fig. 19.

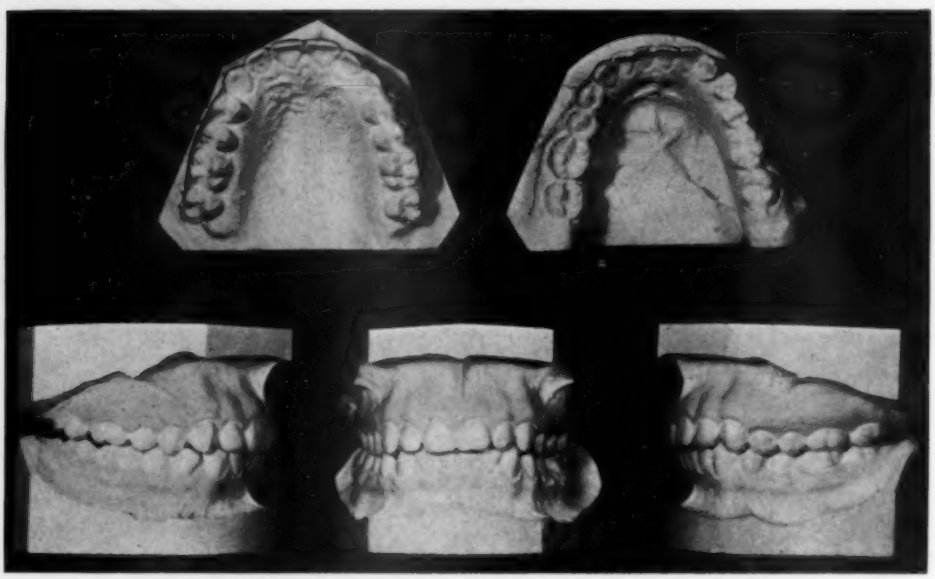

Fig. 20.

I shall now present some before-and-after cases treated by the methods just explained. The first two are twins, a boy and a girl 12 years of age. Fig. 16 shows models of the boy. Notice that he has a bilateral distoclusion, with a labioversion of the maxillary anterior teeth accompanied by a deep overbite, also that the mandibular right first premolar is in linguoversion to the maxillary arch. Bands were placed on the first molars and the four maxillary anterior teeth. I used a tubular lingual arch on the maxillary arch and a staple lingual arch on the mandibular.

Fig. 17 shows the case at the end of the retention period. Notice that the bite has been opened and that we have a normal mesiodistal relation of the arches. This case was retained with the Hawley plate, with a vulcanite inclined plane in the maxillary arch and a soldered lingual appliance on the lower arch.

Fig. 18 shows profiles of the case before and after treatment.

Fig. 21.

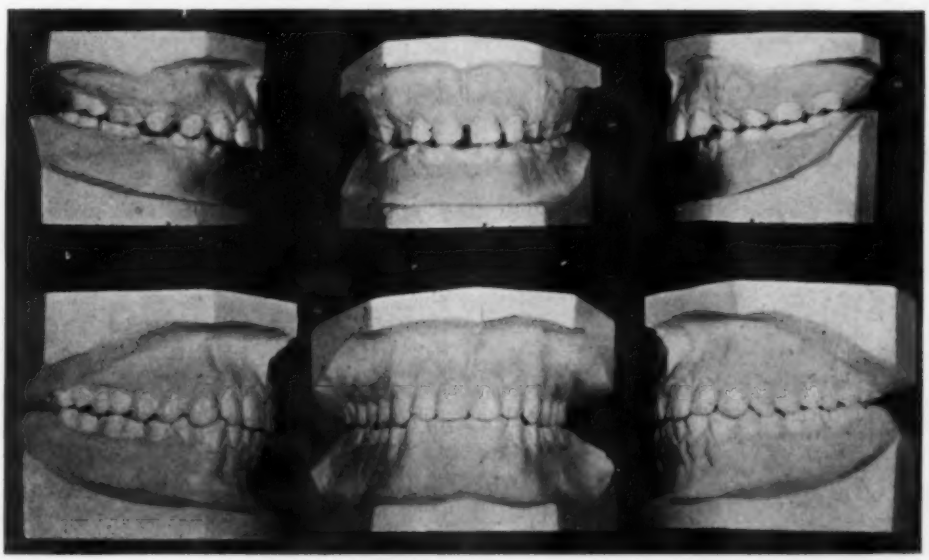

Fig. 22.

Fig. 19 shows models of his twin sister. She was started one year later than the boy. She has a bimaxillary distoclusion with a retrusion of the maxillary anterior teeth or Class II Division 2 (Angle). Notice she has a deep overbite with elongation of the right maxillary central incisor. She was a better patient than her brother, and though her case looks more difficult it was ready for retention at the end of ten months, while his was not ready until the end of twelve months.

Fig. 20 shows her teeth at the end of the retention period. A Hawley plate, with a vulcanite bite plane, was used on the maxillary arch, and since there was little or no widening done in her mandibular arch, no retainer was

placed on it, except a band on the right cuspid with a spur resting against the lingual of the right lateral incisor. This was done because the cuspid had been rotated.

I wish to call your attention to the fact that I have shortened the right central incisor and that we have a normal overbite. Unfortunately, her original photographs were misplaced. However, in Fig. 21 are photographs of her one year after active treatment was finished, which show a rather normal appearance.

Fig. 23.

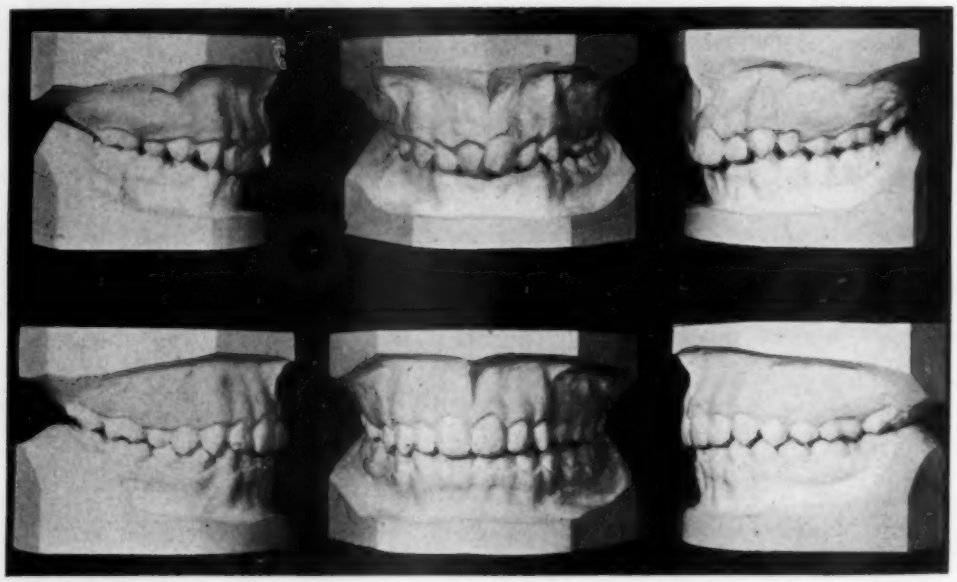

Fig. 24.

Fig. 22 is another bilateral distoclusion with a deep overbite. This boy had been under treatment two years before he came to me. The lower models show this case five years after all retention had been removed. Notice that he has a normal overbite and a normal occlusion.

Fig. 23 shows photographs of him before and after treatment.

Fig. 24 is a model of a boy, 13 years old. I suppose we could call this case a Class II, Division 2A, Angle classification or a distoclusion with a retrusion of the anterior teeth. This boy had a very constricted lower arch with the right first premolars in linguoclusion. He had an extremely deep overbite with the

Fig. 25.

Fig. 26.

Fig. 27.

mandibular incisors biting into the soft tissues of the palate, which is so characteristic of this type of malocclusion.

Fig. 25 shows oral views of this patient with appliances in position after eight months of treatment. A tubular lingual arch was used to expand the maxillary arch. The mandibular arch was expanded with a staple lingual arch. After the bite had been opened by the method previously described, I

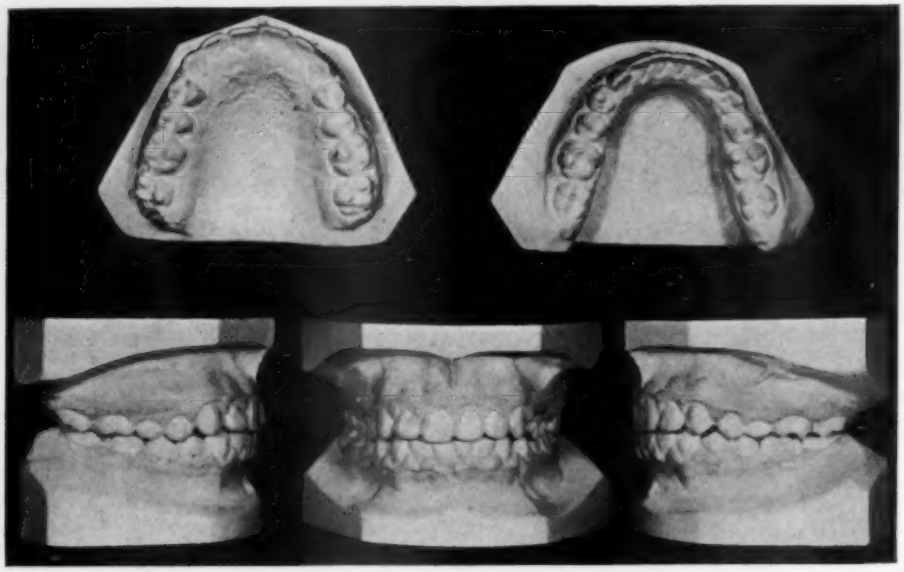

Fig. 28.

Fig. 29.

brought his mandibular anterior teeth forward with a twin-wire arch. When this had been accomplished, the lower arch was removed, and a solid wire was shaped to the mandibular arch and used as a retaining appliance.

In Fig. 24 the lower model shows the case as it is at the present time.

Fig. 26 are photographs of him before and after treatment.

Fig. 27 is a neutroclusion with a malocclusion caused, I think, by the early loss of the mandibular deciduous molars with a resulting impaction of the second permanent premolars and the lack of development in the mandibular incisor region. This case was worked by banding the four anterior maxillary teeth, to which the twin arch was locked. A tubular lingual arch was also used on the maxillary arch for expansion. In the mandibular arch bands were placed on the first premolars and first molars, and with a twin-wire arch the end tubes of which were shortened to rest against the lock on the premolars, coil springs were placed over the end tubes, and the whole anterior segment from first premolar to premolar was moved forward.

Fig. 30.

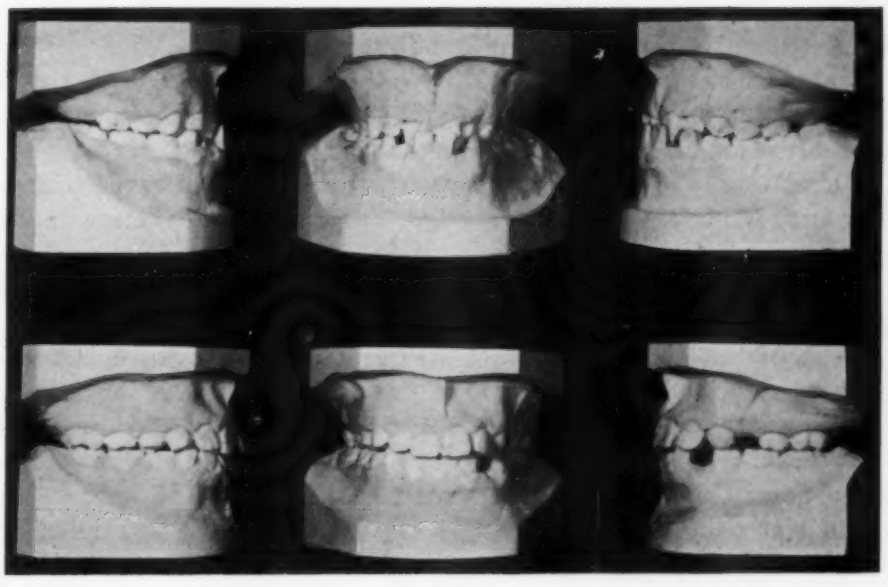

Fig. 31.

After space had been gained for the second premolar, a staple lingual arch was placed on the mandibular arch to bring the second premolars into normal occlusion, and to expand the lower arch. The case was retained with a Hawley appliance on the maxillary arch and a soldered lingual on the mandibular.

Fig. 28 shows the case at the time all retention was removed. You will notice that the overbite is normal.

Fig. 29 shows a malocclusion caused by the early loss of the deciduous molars, in both the maxillary and mandibular arches, resulting in a shifting forward of the molars and premolars in both arches, thus causing the impaction of all four canines. In some of these cases I have extracted all four premolars, with very good results. However, I usually move the molars and premolars distally in both arches by the following method: The twin-arch is adjusted first to the lower arch; the four incisors are banded and coil springs are placed over the end tubes. Fortunately, in cases like this, we usually have a deep overbite, so I take advantage of this condition which keeps the mandibular incisors from coming forward while I am moving the mandibular molars distally. If the deep overbite does not prevent the incisors from moving forward I put on the upper arch and use intermaxillary rubbers from lower to upper, as in a mesioclusion case. This stabilizes the incisors until I have the mandibular molars distally. Then, with the maxillary incisors banded, and the twin-arch adjusted with coil springs over the end tubes, I move the maxillary molars and premolars distally. Intermaxillary rubbers, of course, are used, as in a distoclusion case.

Fig. 30 shows photographs of this patient before and after treatment. You will notice this child's premaxillary region is rather well developed. Now, if, in this case, I had moved the anterior teeth forward I would have gotten a bimaxillary protrusion. The after picture shows that this was not done. In fact, the child's profile is about the same after as before treatment.

Fig. 31 shows models of a 6-year-old child whose case was developing into a mesioclusion. Bands were placed on the deciduous second molars and the two maxillary central incisors. This child had a tubular lingual arch on both the maxillary and mandibular arches. A 0.007-inch coil spring was placed on the end tubes on the maxillary twin-wire arch. The child was instructed how to use a tongue depressor to prize on the central incisors. The teeth were brought over in about two weeks, and the twin-arch was allowed to remain in passive position until the lateral incisors came in. These were badly rotated and when they erupted sufficiently, bands were placed on them, and they were rotated into alignment. I let the child wear the twin-arch about a year and a half, then it was removed and a Hawley plate substituted.

In Fig. 31 the lower models show the case after the Hawley had been worn for about a year. I have left this bite somewhat deeper than normal, because I think in mesioclusion cases we must depend a great deal on a deep overbite to retain them.

In none of these cases shown was a bite plane used. In fact, I have not used bite planes in my office during the past six years. I abandoned them because I found that in treating cases with a twin-wire arch I do not need them; furthermore, if we can eliminate a bulky appliance like the bite plane, I certainly think we should do so.

752 STARKS BUILDING

THE GENERAL HEALTH BENEFITS OF ORTHODONTIC TREATMENT

JAMES DAVID MCCOY, D.D.S., LOS ANGELES, CALIF.

IF THE physician of twenty-five years ago had been told that the orthodontist would eventually become his indispensable ally in meeting certain important problems affecting child health, he would have been truly skeptical. The prevalent opinion among medical men at that time credited orthodontics with but a pseudo-medical relationship, its chief mission being the alignment or straightening of teeth considered disfiguring to facial expression. The majority of dentists also held a similar opinion and emphasized it by the prominence they gave to mechanical appliances; the ultimate conclusion being that an orthodontist was a clever manipulator of machines, with his work evaluated largely in the class of the dexterous arts. The evolution of orthodontics from that period to the present compares favorably to similar changes in the sciences of medicine and dentistry, with our present concept so altered that little is left of the original picture.

Today orthodontics points with pride to the fact that, through its agencies, serious handicaps to the health and happiness of the growing child may be overcome, and benefits may be achieved which overshadow the fondest dreams of the pioneers who blazed the trail of this branch of the healing art. To evaluate such benefits and make their significance more readily understandable, and also to show their relationship to kindred health problems, it is essential first to survey briefly the nature of the task confronting us, and to outline the scope of the field which must be covered.

At the outset, let us define what we imply by general health benefits. Children considered in normal health must sustain a sufficiently high metabolic balance to provide resistance against the ordinary diseases, maintain the usual growth tempo, proceed through the progressive organic and functional evolvements which characterize the period from infancy to maturity, and develop those mental and psychologic attributes which keep them in proper orientation with their life period. The essential factors for such a state of well-being are numerous and complex and run the gamut which may be said to start with the hereditary background and end with the matured man or woman. Rarely, if ever, do the essential links in the chain remain unbroken through this period, and frequent repairs must be made and maladjustments corrected, if the human mechanism is kept in balance.

The great amount of thought given the child patient during recent years has done much to maintain a high level of child health and has made of pediatrics one of the very important specialties of medicine. Such medical men occupy a position of paramount importance in the child problem, but have as their allies practitioners of dentistry, orthodontics, orthopedics, opthalmology, otolaryngology, general and oral surgery, experts in the field of nutrition, and the many

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other agencies which, if applied at the right time, not only check incipient diseases, but establish that degree of bodily balance which we call "health." To discuss the interdependent relationship of all these helpful agencies to the problem is not my purpose, but I shall endeavor to outline the special mission of orthodontics and what its fulfillment means to the growing child.

The proper growth of the young individual may be listed among the first essentials to health. This applies to the body as a whole, and also to that part of it which claims our interest. Inclusive with other things, we know that this complex process depends upon the ingestion of essential food factors in sufficient amounts to fulfill natural requirements, upon the nutritional effects of oxygen gained through respiration, and upon the normal use or functioning of all related parts.

One of our more distinguished pediatricians has made the statement that malfunctioning teeth, regardless of whether their impairment be due to caries or to the presence of an oral anomaly, are responsible for an unusually large number of gastrointestinal derangements in children. It is obvious that the improper preparation of food, due to lack of normal masticatory function, could account for this, especially in sensitive individuals, and result in growth inhibitions. This fact has long been appreciated by those having an intimate knowledge of oral physiology and a more widespread appreciation of its significance would mean much to children.

The additional fact that the denture fulfills important functions relating to respiration and to the general plan of growth and development in the face, needs to be impressed, for aberrations of growth resultant from disturbances here may be far-reaching and serious. Under normal conditions, inspired air is received through the nose, where it is warmed and strained of impurities before entering the lungs, these two essentials being highly important, both to the health of the structures entering into the act, and to general health.

In conjunction with the respiratory act, certain functional movements are performed in which the teeth, the lips, and the tongue should play an important part. Swallowing is frequently indulged in, especially after the act of speaking or smiling, or other facial muscular movements have occurred, and just preceding this action, the mandible is raised and the opposing jaws are brought into their natural relationship. Coincident with the action, the tongue expresses the air between itself and the roof of the mouth, the lips are sucked back against the teeth, the lower lip just binding over the lower edges of the upper incisors. The tensor and levator palati having raised the soft palate during swallowing then allow it to drop upon the dorsum of the tongue, thereby shutting off the oral cavity. The mandibular teeth separate themselves slightly from contact with the maxillary teeth and the mandible is suspended in this relationship with the muscles of the cheeks and lips, as well as other adjacent muscles, in a state of rest and balance. In normal respiration, there is an exchange of air in the accessory sinuses, and during swallowing the orifice of the Eustachian tube is opened and an exchange of air takes place in the middle ear.

Now let us consider the functional mechanics involved when a dental anomaly is present which renders these functional movements difficult, or pre-

vents them from being carried out. Under such conditions, the tongue is not held in the roof of the mouth, the upper teeth are deprived of their inner muscular support, and an unbalanced relationship between the external and internal muscular forces is put into effect. The lips are not drawn back against the teeth, the upper lip exerts but slight pressure, while the lower lip, instead of binding over the lower edge of the upper incisors, turns outward and rests partially or wholly in between the upper and lower incisors and becomes a factor in pushing the upper anterior teeth forward. The bones of the face are, therefore, subjected to the perverted mechanical action of mal-locked teeth, to perverted muscular action due to the altered functions of the mouth and nose, and to the altered mechanics of having the air pass through the mouth instead of the nose. The functional mechanics of the relationships just described are amply demonstrated by Figs. 1 and 2.* In Fig. 3 are shown three cases, all from the same family, where "mouth breathing" had been practiced since infancy. In Figs. 4 and 5 the health benefits of orthodontic treatment are demonstrated.

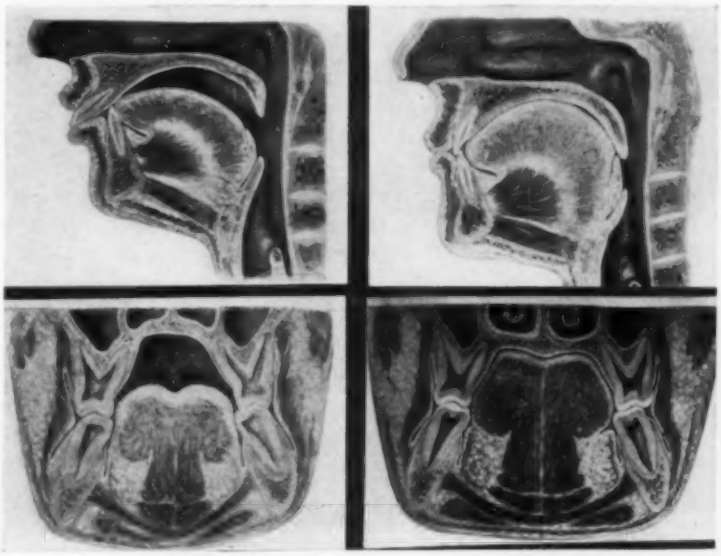

Fig. 1.—(Right) Relations of the lips, teeth, and tongue under conditions of normal anatomic and functional balance. (Left) With such relationships disrupted and a frequently occurring dental anomaly established. (After Lischer.)

We may say, therefore, that inclusive with other factors which will be named later, *benefits of primary importance to general health from orthodontic treatment lie in the restoration of masticatory function; in maintaining essential relationships to normal respiration; and in the interrelated functions within the oral ensemble which promote normal facial growth.* While we do not know what the growth impulse is, we have all seen impressive evidence of the truth of the old adage that "function and growth go hand in hand," and where there be improper correlation of parts, or if the positions of these parts are maintained incorrectly, the human machine works uneconomically and out of balance. Any complete discussion of either of these three primary benefits would constitute a paper of length, so no attempt will be made to do this now.

*Figs. 1, 2, 4, 5, 6, 8, and 9, are taken from *Applied Orthodontics*, Ed. 5, 1941, and are used with the permission of the publishers, Lea & Febiger, Philadelphia.

Fig. 2.—Intricate arrangement of the facial muscles. Malfunction of the orbicularis oris, or "lip muscle," disrupts the functional balance which is so important to the dentofacial area. In the habitual mouth-breather malfunctional stresses are put into effect which contribute to malgrowth and deformity. (After Gerrish.)

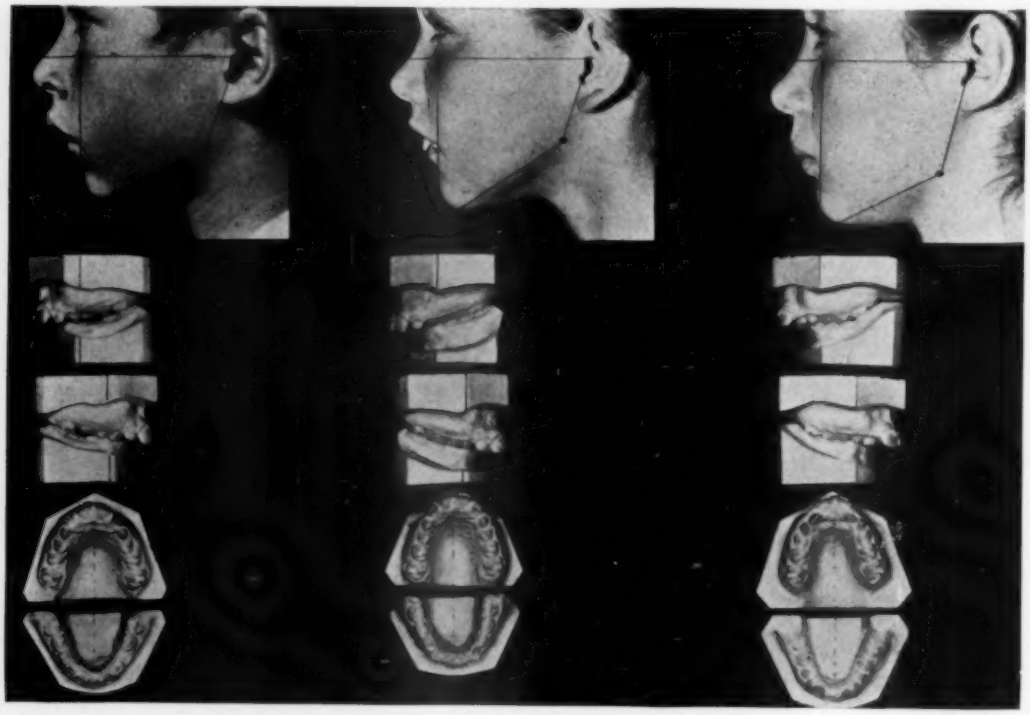

Fig. 3.—Three children in the same family who had been "mouth-breathers" from infancy. The similarity of their dentofacial anomalies is very striking.

We shall rather approach the matter in a general way and show how in meeting the orthodontic problem these objectives are frequently realized. In some instances, the need for all three is apparent, and in the course of treatment each in its turn acts in a reciprocally helpful manner, favorable to the relief of the others.

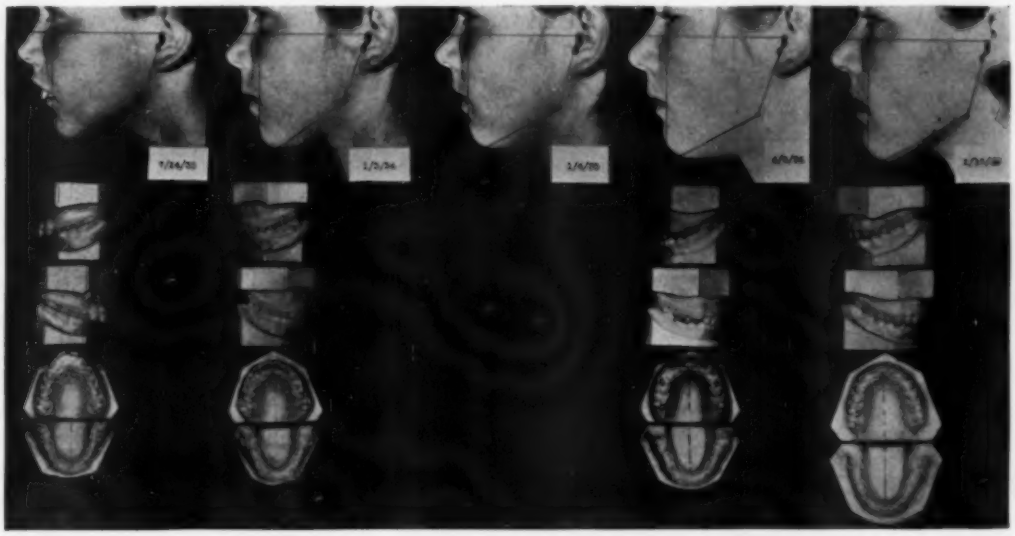

Fig. 4.—A series of dentofacial records of one of the children shown in Fig. 3, demonstrating the beneficial growth changes occurring with orthodontic treatment.

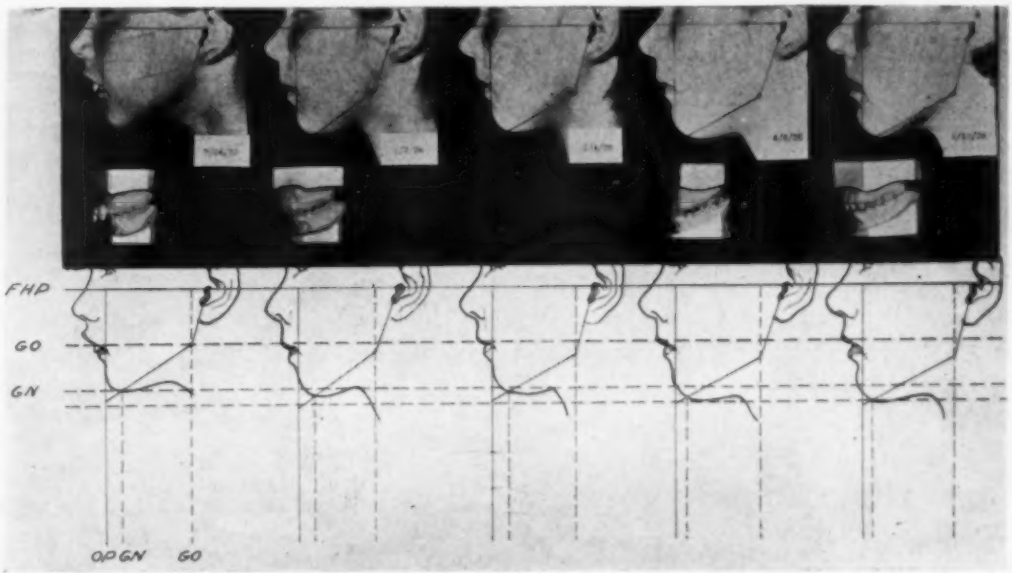

Fig. 5.—An analysis of the facial growth changes resulting, in part, from orthodontic treatment. In addition to both vertical and horizontal growth, favorable muscular adaptation is apparent.

Primarily the orthodontist is concerned with the prevention and correction of dental and oral anomalies; he must consider the etiology of such conditions, determine their nature, location, and extent, and endeavor to restore affected parts to normal form and function. Deviations from the normal may be mani-

fest by one or more teeth being malaligned; by groups of teeth in one or both dental arches contributing to the anomaly; by opposing dental arches being malformed or malrelated; or by the maxilla or mandible, or both, being included in the deformity. In fact, in a large percentage of the cases we are dealing with dentofacial deformities which are complex morphologic deviations, involving the jaws and, in many instances, some of the external features of the face. In addition, we may have such miscellaneous deformities as those resulting from maxillary cleft, abnormalities of dentition manifest as anomalies of form, of number, and eruption; groups of deficient or malfunctioning muscles, and abnormal developments of the tongue. It should be obvious, therefore, that the term "malocclusing teeth" inadequately describes the varying conditions and relations manifest.

In confirmation of this statement, your attention is called to Fig. 6, where a study in dental and oral anomalies is shown. In some few, the abnormality is limited to the denture alone, but in the majority of instances it includes the jaws and some of the external features of the face. In other words, they represent conditions wherein aberrations of growth and function are manifest. The extent of their development represents the degree to which normal processes have been interfered with or inhibited and depends largely upon the age period when such influences were made effective.

From the facts which have been presented thus far, it would be obvious that "the common ground of orthodontics and pediatrics lies in the interest which the practitioners of each branch have in the principles which underlie growth and function. Orthodontics focuses its attention through a glass of high magnification upon the teeth, the maxilla, and the muscular apparatus pertaining thereto; while pediatrics, with perhaps less detail but equal sincerity of purpose, views the whole structure of the young individual and all his functions."[1]

When we approach the question of etiology, we come face to face with the same factors which must be considered with analogous conditions outside the oral field. As causes, we may include all conditions, influences, diseases, or agencies which interfere with the factors governing normal growth processes, and thereby render bodily parts susceptible to alterations of structure, function, and malgrowth. As the process of growth may be said to begin with the egg and end with the adult, it is not surprising that in numerous instances the question of etiology remains largely a matter of conjecture.

During the past decade, physiologists have been stressing, with increasing emphasis, the importance of the endocrine bodies in the role of growth. Orthodontists, in general, are assuming that malfunction of these glands may account for delays, or retardations, or other effects upon bodily growth, and may be a contributing influence in the field of dental and oral anomalies. We are told that, with general metabolic conditions in balance, the endocrine system fulfills highly important missions, but that congenital or infectious diseases throw these factors out of balance, and growth anomalies and other pathologic manifestations become evident. To state it otherwise, the mechanism of growth and development is more or less reciprocal and these glands influence it, and are themselves changed by intervening conditions. Some endocrinologists claim

Fig. 6.—A study in dental and oral anomalies illustrating a variety of combinations. In some few, the deformity is limited to the denture alone, but in the majority of instances the involvement includes the jaws and some of the external features of the face.

that when the physiology of these important organs is more fully understood, and a rational therapy developed, orthodontics will be among the chief beneficiaries. We are sincerely hopeful that their predictions are well founded.

It has already been made evident that in orthodontics we lay great emphasis upon function and its relationship to growth in the oral structures. *It is, of course, of paramount importance that general metabolic balance be established so that patients will become favorable "orthodontic risks," and functional responses be adequate.* In utilizing the function principle, it is first necessary to bring about growth changes affecting the form and relationship of the dental arches and jaws so that they may be in anatomic balance, and then to direct our efforts toward certain groups of oral and facial muscles, bringing them up to normal, both in tone and action. The need for such measures is especially apparent in those cases where mouth breathing has been practiced as a habit through long periods. Even after the most skillful rhinologic attention, many of these fail to develop normal respiration, due to the fact that the muscles having to do with normal lip function, or those controlling the position of the mandible, are underdeveloped or uncontrolled by the patient. This muscular work must, of course, go hand in hand with orthodontic treatment and should not be initiated until anatomic changes have been affected, which will make it possible for patients to place their teeth and jaws in proper functional relationship. This is usually taught them after major interferences have been removed.

In emphasizing the importance of restored function to oral and facial growth, the obvious injurious results of malfunction, if continued, become apparent. In effect, malfunction and malposture become synonymous, for the harmful pressures exerted have their malinfluence whether the application is made in the muscular draperies of the face, or elsewhere. Among the more important and far-reaching of these sources of pressure may be listed: first, certain abnormal muscular habits exerting stresses against the teeth and jaws; i.e., *such habit spasms as biting the lip or tongue, sucking the thumb, etc.* The results of such pressure habits are shown in Figs. 7 and 8; second, pressure from malfunctional facial and oral muscles as a result of mouth breathing; and third, certain forms of external pressure, as that applied when "pillowing" with the face against the hands, arms, or other unyielding objects; such posture habits as sitting with the weight of the head supported by the palms or outside of one or both hands, or any other relationship which brings pressure to bear against the teeth, dental arches, or jaws. Fig. 9 shows a typical instance of pressure from "pillowing." The damaging effect of such agencies depends upon the length of time they are in effect, and the nature of predisposing conditions which accompany them. These habits must be discontinued if treatment is to be successful, and this requires strong conscious effort on the part of the patient. *Unfortunately this cooperative response is frequently lacking.*

We frequently encounter a pessimistic attitude toward orthodontics, the assertion being made that far too many failures in treatment are evident. It is true that numerous children have been subjected to treatment without permanent benefit. This, however, is not because orthodontics is incapable

of coping with the problem, but to other causes which I shall mention. First and foremost, numerous unqualified practitioners have attempted orthodontic operations. This has been unfortunate, both for the patients and for the good name of our specialty. Even the best qualified are frequently beset by handicaps which prove disheartening, not the least of which is a failure on the part of parents to take the orthodontic problem seriously. So much of it is concerned with the growth problem, and must extend through comparatively long periods of time, that it becomes increasingly difficult to hold their interest to the degree necessary. Frequently, children undergoing treatment are sent away to boarding schools, and such interruptions often prove disastrous. To the practitioner, however, who is qualified, and who has the capacity of gaining and holding the interest and cooperation of patients and parents, orthodontics

Fig. 7.

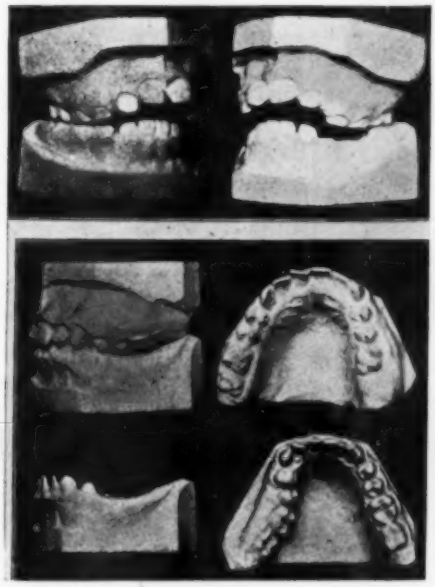

Fig. 8.

Fig. 7.—A dental anomaly resulting from the habit spasm of lip-biting.

Fig. 8.—Two serious dental anomalies resulting from the pressure habit of "tongue-biting." In the case shown in the upper part of the illustration, the tongue was held between the incisors. In the other case, it was projected toward the left cheek and then drawn over the lower bicuspids and molars. In both instances the results of the pressure are very apparent.

Fig. 9.—A pressure habit wherein the "pillowing" against the hand, or any other unyielding object, may have injurious effects.

offers an opportunity for benefits comparing favorably with the other high attainments of the healing art.

In naming the general health benefits of orthodontic treatment, one of paramount importance has been omitted until now, which we may classify as being *psychologic in character.* In the competition of life, an individual is entitled to every advantage which is rightfully the heritage of nature. Given a reasonable degree of health and mental equipment, a growing child may cope effectually with its environment and develop traits and character patterns which make for success and happiness. If this is achieved, he or she must develop a personality which truly reflects the habits and character of the individual. Personality is perhaps the greatest factor in life and, while it is, strictly speaking, not a physical attribute, mental and spiritual accomplishments are reflected more or less in the physical. At least this is true so far as our judgment of people is concerned. First impressions are often lasting, hence the importance of the manner, the bearing, the figure, and the face of the individual. A child with a receding chin, a protruding mandible, or even a mouth full of teeth at variance with normal arch form, is frequently misjudged because of its appearance. Such a child usually divines such attitudes and may become more or less convinced of its inability to cope with its environment, or if mentally strong enough to rise above such influences, will still be keenly sensitive of its physical misfortune and suffer great unhappiness. Under such conditions, it becomes increasingly difficult to develop the self-poise and self-confidence which are so essential to progress and happiness in later life. Let us affirm, therefore, that one of the chief objects of orthodontics is to make possible the normal development of the mouth and its correlated structures so that the child may have imprinted upon its face a personality which is the true expression of its character.

From our discussion thus far, it will be apparent that the common bond between orthodontists and other practitioners of dentistry and medicine lies in the desire of each group to help children. In this task each has something to offer which is indispensable. Let us hope that the future will see these benefits received with greater appreciation and by increasing numbers of children, to the end that health and happiness shall more freely abound.

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RICKETS

Caries, Hypoplasia, and Malocclusion of the Teeth

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THIS thesis has as its purpose a résumé of the broad aspects of rickets and an analysis of a study of the relation of rickets to dental caries, enamel hypoplasia, and malocclusion in children.

Rickets[1] is a constitutional disease of infancy in which the bones become soft and flexible from retarded ossification, due to a deficiency of calcium in the diet. The disease is marked by bending and distortion of the bones under muscular action, with consequent deformity, muscular weakness, nervous disturbances, sweating of the head, and degeneration of the liver and spleen. In addition, feverishness, convulsions, diffuse tenderness, nausea and vomiting, abdominal distention, and slight diarrhea are also associated with the disease. The eruption of the teeth is almost always delayed, and when the teeth do appear they are badly formed.

Observations of investigators have shown that lack of sunlight, lack of calcium and phosphorus, and vitamin D deficient diets, dampness, poverty, and sometimes syphilis are the most frequent etiologic factors of rickets. Of these factors, diet and lack of sunlight are the most important, either being so potent that, if adequate, it can compensate for a deficiency of the other. Thus,[2] sunlight will prevent rickets, even though the diet may be poor, and a properly arranged diet will prevent rickets in the absence of sunlight. Both factors must be qualitatively proper. The quantity of food is immaterial; the diet must contain certain antirachitic substances and the sunlight must contain an abundance of ultraviolet rays.

Rickets is known the world over, despite the former feeling that it was unknown in many parts of the world. The disease has its greatest frequency in the temperate zones, where people are so frequently crowded together in the larger communities with little fresh food and small opportunity to be in the open air where the benefits of sunlight are so easily obtained. In tropical and semitropical climates, children are relatively free from rickets, apparently because they are in the sun so great a part of the time. However, in Hutchison's and Shah's studies in India they have shown that if children in the tropics were confined continuously to the house, rickets was frequent and severe. Negroes and Italians, when removed to cities of the temperate climates away from warm countries, fall easy prey to rickets. In New York, the greatest susceptibility to rickets has been among the Italian and Negro races. These southern races seem to bear the climate and confined life of the northern cities very badly.

Submitted as partial requirement for a certificate of the American Board of Orthodontics.

Rickets will affect both males and females with equal frequency, and the symptoms usually will manifest themselves between the ages of four and twenty months.

The only constant and characteristic lesions of rickets are found in the bones; these changes are sufficiently definite to give it a place as a distinct disease.[3] One of the most striking features of rachitic bones is their unnatural flexibility. This is due to the lack of mineral salts in the bones and especially the lack of calcium and phosphorus. Normally, bone contains one-third organic and two-thirds inorganic matter. In marked rickets, this ratio is reversed, the ones containing twice as much organic as inorganic matter. Almost the entire loss is in the calcium-phosphorus content. The changes in the flat bones are nearly universal. Those at the epiphyses show a marked parallelism with the activity of growth. Where growth is most rapid, the lesions are most advanced. The middle ribs are earliest and chiefly affected; following are the other ribs and the lower femoral epiphyses, the lower extremities of the radius and tibia, and eventually, in some cases, all the long bones including the metacarpals and phalanges. There are definite characteristic changes in form. The most constant changes are enlargement at the epiphyses, which is strikingly seen at the lower extremities of the radius and tibia and at the costochondral junction of the middle ribs. All the sharp angles, borders, and prominences of the bones are effaced. The curvatures of rachitic bones are allowed by the increased flexibility due to the loss of the mineral salts. They may be due to a variety of causes. Some are simply an exaggeration of the normal curves much increased by the swelling of the epiphyses; others are due to muscular action, to atmospheric pressure, to some unnatural posture, such as the cross-legged position, to the weight of the limbs or the weight of the body. Marked deformity is usually due to displacement of the epiphyses or to fracture. Displacement of the epiphyses is rare except in the ribs, where it occurs, to a certain extent, in every advanced case. Fractures of the long bones are very common and most frequently broken are the radius and ulna, the ribs, humerus, femur, fibula, and clavicle. The fractures are usually of the green-stick variety with more or less impaction, and are generally followed by the production of considerable callus, though subperiosteal solution of continuity is occasionally found with no deformity and little, if any, callus. When bending occurs, there is a production of new tissue beneath the periosteum to compensate for the mechanical disadvantage of position in which the new bone is placed. The shafts are frequently greatly thickened. The principal change in the form of the flat bones consists in the production of large prominences upon the parietal and frontal bones, due to an increase of vascular, immature bone beneath the periosteum. These prominences are found where the normal bending produces the greatest stress upon the bone. The deficiency in calcium and phosphorus over areas in the occipital bone that are thin even under normal conditions, allows them to be indented by finger pressure.

The symptoms upon which a diagnosis of rickets can be based relate chiefly to the bones.[4] Lesions of the bones must exist some weeks before they reach a degree that can be recognized clinically. Investigators have found evidences of the disease by microscope as early as the end of the second month. Clinically, the evidences of rickets are seen before the fourth or fifth month.

A well-marked case of rickets makes a striking picture and one not easily mistaken. There are the unmistakable large head, beaded ribs, narrow chest, prominent abdomen, symmetrical swellings of the epiphyses of the wrists and ankles, and curvatures of the extremities. The beginning of the symptoms is nearly always insidious, and the patient does not usually come under observation until they have existed for several weeks, often several months. The most common early symptoms are sweating of the head, extreme nervousness at night, beading of the ribs and craniotabes. The head sweating is rarely absent and may continue for several months. It is especially profuse during sleep, the perspiration standing out in large drops upon the forehead, often being sufficient to wet the pillow. This symptom is one of the causes of nasal and bronchial catarrh, so common in rachitic infants. The beading of the ribs is almost invariably the first appreciable change in the bones, and it is practically constant. This forms the so-called rachitic rosary, consisting of nodules at the line of junction of the costal cartilages and the ribs. In infants under 6 months there may be found soft spots in the cranium, usually over the occipital or posterior portions of the parietal bones. By pressure with the finger, they give a sort of parchment-crackling sensation. This condition is known as craniotabes. The deformities of rickets are almost invariably symmetrical in character and usually numerous. In extreme cases, almost every bone in the body is affected. The head usually appears to be too large, and although it may not be greater in circumference than that of a healthy child of the same age, it is out of proportion to the rest of the body. The enlargeme is chiefly due to the thickening of the cranial bones, and this thickening in many cases remains throughout life larger than it should be, even though there has been some diminishing with recovery. Beading of the ribs is a most characteristic feature, and in addition there may be lateral depressions over the lower third of the chest at the line of junction of the cartilages with the ribs. In severe cases, these depressions or furrows are so great as to cause serious deformity. In the milder cases the spine remains normal. The most characteristic deformity consists of a posterior curve, which is a general one, usually extending from the mid-dorsal to the sacral region. Deformities of the upper extremities are usually symmetrical with the humerus affected in only severe cases. The radius and ulna are frequently affected and they present a convexity upon their extensor surfaces which in some cases is very marked, particularly in children who have been creeping. The lower extremities are rather more frequently affected than the upper, but in a similar way. The principal deformities of the lower extremities are bowlegs and knock-knees. The muscular symptoms of rickets are almost as constant and as characteristic as bones. The muscles are small, very flabby, and poorly developed; hence rachitic children are unable to sit erect or to stand or walk at the usual age. Of 151 cases reported by Holt and Howland,[5] twenty-seven, or 18 per cent, walked before the fifteenth month; 47 per cent were not walking at the eighteenth month; 20 per cent were not walking at 2 years; and 10 per cent were not walking at 2½ years. Late walking is one of the most common symptoms for which advice is sought by parents with rachitic children. Holt and Howland[6] also report that of 150 rachitic children, 50 per cent showed eruption of the deciduous teeth beginning by the eighth month; 20 per cent had no temporary teeth erupted

by the first year; and in 8 per cent no deciduous teeth had erupted by the fifteenth month. Even though the teeth may begin to erupt at the average age in the deciduous dentition, the process is usually retarded by the development of rickets. The character of the deciduous teeth in rickets is good, and is in striking contrast to the deciduous teeth of hereditary syphilis, where an early tendency to decay is seen. The teeth of the permanent dentition are frequently lacking in enamel and show an early tendency to decay. Neff[7] states of the tardy eruption of the teeth that it is the rule in rachitic children, and though the two mandibular central incisors, which are the first to appear at 6 to 8 months of age, are not much if any delayed, the remainder of the teeth are three or more months behind. Neff also states that changes such as poor growth, pitting and loss of enamel, and early crumbling and caries have been ascribed to rachitic disease, but he claims that this has not been proven. Children suffering from marked rickets are almost always anemic, and the majority are fat and flabby. These patients suffer from hypertrophied tonsils, adenoid growths of the pharynx, and enlargements of the lymph nodes of the neck. The resistance to infection of these patients is very feeble, their digestion is disturbed, and they are especially subject to inflammatory processes in the upper and lower respiratory tracts.

The diagnosis[8] of rickets is not usually difficult. The most important early symptoms for diagnosis are sweating of the head, craniotabes, great restlessness at night, delayed dentition, and enlarged fontanel. Collectively, these symptoms can mean nothing but rickets. In the later stages, some of the characteristic deformities are usually present, the most constant being the beading of the ribs, enlargement of the epiphyses of the wrists and ankles, and bowlegs.

Rickets is seldom,[9] if ever, a cause of death except in cases with the most extreme thoracic deformity. It is, however, a large factor in the mortality of the first two years, as it predisposes strongly to many forms of acute disease. It is an important etiologic factor in certain serious nervous conditions, especially tetany. Rickets adds very greatly to the danger from all acute diseases of infancy, particularly those of the respiratory tract. The encroachment upon the capacity of the lungs by a marked thoracic deformity may in itself be enough to keep a child in a delicate condition and retard his growth. At the same time, such a condition is a constant invitation to acute attacks of bronchitis or pneumonia. The effects of rickets upon the future health of the child depend chiefly upon the presence and extent of the thoracic deformity. When this is severe, the child usually succumbs to some acute respiratory disease during the first few years of its life. When this is absent, although children may remain somewhat dwarfed on account of their short legs, in other respects they may be as well as if they had never been the subject of rickets.

Rickets can be prevented[10] and it can be cured in at least three different ways: by employing vitamin D therapy, by exposure to sunlight, and by the use of a lamp giving off ultraviolet rays. At the present time, vitamin D therapy is used almost exclusively for the prevention and cure of rickets. With the administration of vitamin D, there is an improvement in the calcium and phosphorus balance with resultant healing of the disease. From the clinic of Dr. J. M. Lewis[11] of the Department of Pediatrics, New York University

College of Medicine, and Children's Medical Service, Bellevue Hospital, comes the statement that the exact mechanism by which vitamin D increases the retention of calcium and phosphorus is not known. Some investigators believe that it aids in the absorption of calcium and phosphorus; others that it has a local effect on the bones which makes possible proper anchorage or deposition of calcium and phorphorus salts. It is quite possible that both views are correct. Vitamin D would thus have a local, as well as humoral, effect.

Antirachitic agents may be divided into three main groups: (1) fish liver oils; (2) irradiated sterols; and (3) vitamin D milks. Lewis reports that he has found one teaspoonful of a good cod-liver oil will protect 50 of 51 infants, most of whom were negroes, against rickets. The great disadvantage of cod-liver oil is that it is often refused by infants because of its unpleasant taste. A comparatively new fish oil that is meeting with great favor is percomorph fish oil. Lewis reports that 2 drops (440 U.S.P. units) will not only prevent rickets in negro infants but will also cure cases of moderate severity. Since the generally recommended dose is 8 to 10 drops for prevention, it is apparent that the margin of safety is great. This preparation has its greatest advantage in that it is given in drop dosage and therefore is rarely refused. Viosterol, which is an irradiated sterol, contains a very high concentration of vitamin D and is particularly useful in severe cases of rickets, as they require large amounts of vitamin D for cure. In resistant cases of rickets, as many as several hundred thousand units of vitamin D per day may be necessary, which amount can be readily administered in the form of viosterol. At the present time, there are three types of vitamin D milk available: irradiated milk, milk to which vitamin D concentrates are added directly, and milk produced by cows which have been fed irradiated yeast. In 1932, Hess and Lewis found that irradiated milk was a satisfactory antirachitic agent. In their studies, eighty-eight infants were given irradiated milk throughout the entire winter, and only one developed roentgenologic rickets. The sole exception was a premature baby who weighed 4½ pounds at birth. These observations have been confirmed by Stokes and his collaborators, Tisdall, Drake, and Brown, as well as by other investigators. Milks to which cod-liver oil concentrate or irradiated ergosterol is added are produced commercially and are required to have a potency of 400 U. S. P. units per quart. Clinical experience, reports Lewis, with these milks has demonstrated that they will not only protect the average infant against rickets, but will also cure moderate cases. Vitamin D milk produced from cows fed irradiated yeast is generally referred to as metabolized vitamin D milk, and contains 430 units per quart. The antirachitic factor in irradiated yeast is irradiated ergosterol, which is unchanged by the cow and is secreted as sent into the milk. This milk was found by Hess and his co-workers to be satisfactory for the prevention of rickets, as well as for the cure of moderate cases.

Antirachitic therapy should be begun at 3 to 4 weeks of age in full-term infants, and at 2 weeks of age in premature infants. It may be discontinued in the full-term infant during the summer months, unless the infant is confined indoors during this season. Not only has there been a reduction in the incidence

of rickets as a result of the widespread use of antirachitic agents, but there has also been a sharp drop in the number of cases of infantile tetany. Although rickets is uncommon during childhood, nevertheless vitamin D therapy should be given throughout this period inasmuch as this vitamin brings about an optimal retention of calcium and phosphorus and probably is also of value in the prevention of dental caries.[12]

H. J. Gerstenberger[13] states:

> "Both the temporary and the permanent teeth are affected by rickets. According to Gundobin, the incisors of the temporary set can be affected by rickets, from the sixteenth fetal week to the fifth month post partum, the first permanent molars from the sixth fetal month to the eighteenth month of extrauterine life, and the permanent incisors from the first month post partum to the fourth year. In 84 per cent of the cases, according to Gundobin, the incisors are mainly affected. The most common symptom caused by rickets in the process of dentition is a delayed, asymmetric, and irregular eruption of the teeth. We find further that the teeth are small, soft, discolored, and broken easily. In severe cases the softening process amputates the tooth at the gum. According to Pfaundler, the temporary teeth show the lesions of rickets mainly at the neck of the tooth and at the root, while the permanent teeth show upon the cutting surfaces and the crowns the so-called erosins. Syphilis and tuberculosis have been blamed for these changes in the teeth. It is, however, doubtful, according to Lesage, whether they play any direct part in the production of the symptoms just mentioned. He seems to feel that if a child with syphilis or tuberculosis has no nutritional disturbance and is well nourished its teeth will be just as sound as those of any other child. It is of course plausible that lues and tuberculosis can augment the deleterious effects of rickets in a child that is nutritionally disturbed, as each rachitic child is. At any rate there is no question in any of the authors' minds that the symptoms stated are due in practically all of the cases to rickets."

Hess[14] states that there are two distinct aspects of the involvement of the teeth in rickets, the one relating to the evolution of the teeth, and the other to their structure:

> "It has long since been observed that rickets occasions a delay in dentition, the eruption of the first tooth being postponed sometimes until toward the end of the first year. The elder Kassowitz even went so far as to employ the rate of dentition as a gauge of the efficacy of antirachitic therapeutic measures. Heubner, Marfan, Still and Holt all make mention of retarded dentition, Still believing that this symptom is 'one of considerable value in diagnosis.' Recently Blum and Mellion, of my clinic, carried out an investigation of the relation of rickets to teething, as exact data on the subject were found to be scanty and it has not been studied since the era of the newer rickets. An exceptional opportunity was afforded for an accurate investigation of this kind as the infants could be supervised for a period

of months or years and their hygienic surroundings and diet were exceptionally good. These investigators summarized their results as follows: 'A study of mild rickets by means of clinical, roentgenological and chemical methods showed that dentition is delayed even in this group of cases.' The accompanying table and diagram form the basis of this conclusion, and among other points show that whereas about one-half the number of normal babies developed a tooth between the sixth and the ninth month, only about one-fourth of the infants with mild rickets had a tooth at this age. In spite of these figures the secondary conclusion was drawn that 'as a diagnostic sign of rickets, delayed dentition possesses little significance, however, owing to the variability in the time of eruption of deciduous teeth.'

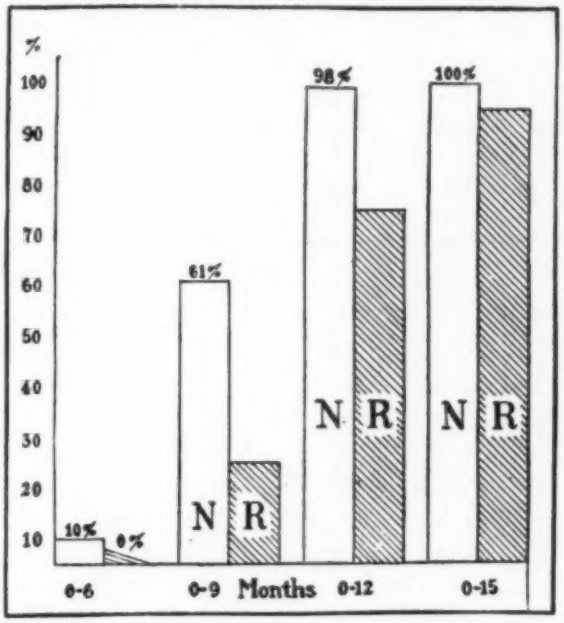

Fig. 1.—Comparison of time of eruption of first tooth in normal and rachitic infants. Delayed eruption during first year due to rickets. (From Blum and Mellion, *J. A. M. A.*, 1926.)

TABLE I

TIME OF APPEARANCE OF FIRST TOOTH (QUARTERLY PERIODS) IN INFANTS WITH AND WITHOUT RICKETS

AGE IN MONTHS	WITHOUT RICKETS	WITH RICKETS
0 to 6	7	0
6 to 9	35	23
9 to 12	25	42
12 to 15	1	18
15 to 21	0	4
Total	68	87

(Hess: Rickets, Osteomalacia and Tetany, Table XVIII.)[34]

The more important question is that of the role of rickets in the development of dental caries. Until recently the opinion prevailed that caries is brought about by a solution of the inorganic salts of the teeth resulting from acid fermentation in the mouth, and that this

fermentation is accompanied by a solution or digestion of the organic substances by proteolytic bacterial ferments. This conception was based on the well-known experiments which Miller carried out some twenty years ago. Recently, however, the bacterial theory has been displaced by the concept of inadequate nutrition. Dick has carried out the most extensive clinical investigations in this field, and it will be well to illustrate this point of view by citing his conclusions. He found that it was practically impossible to make accurate observations of the temporary teeth of children of school age as caries was so universal and extensive as to completely mask the hypoplasia. In a study of the permanent teeth, however, 586 children who had suffered from rickets, 42 per cent were found to have teeth which were normal, and 58 per cent teeth which were defective or decayed. Among the latter, 20 per cent showed hypoplasia frequently combined with decay, and 38 per cent showed simple decay. In order to understand the point of view of those who believe that caries is the result of rickets, one must bear in mind the prenatal and postnatal periods of calcification of the temporary and the permanent teeth. This is sometimes presented in the form of diagrams, but it is probable that the process is by no means regular. The usual statement is that 'at birth one-half the crowns of the incisors, the tips of the canines and the cusps of the molars are calcified in the temporary set, and by about six months after birth the calcification of the crowns is completed.'

"After a careful search for a hypoplastic condition of the biting edge of the temporary incisors, Dick failed to detect a case, either in school children or in the babies who attended infant welfare centers. This, as he states, is strong evidence that rickets is not a congenital condition.

"In the permanent teeth, the enamel which is attacked is believed to be identical with that laid down during the first two years of life, in other words that of the lateral incisors, the tips of the canines and the crowns of the first molars. Of the cases with carious teeth Dick found that the lower first molar was decayed in 80 per cent and the upper first molar in 30 per cent. The fact that the lower first molars decay out of proportion to the others 'is to be attributed rather to the main part of the enamel of the crown having been laid down in the first two years of life when rickety conditions are operative.'

"The most extensive experimental investigation of this subject is that of May Mellanby, carried out on the puppies which her husband used in his well-known nutritional studies of rickets. The diet of these dogs consisted mainly of bread and separated milk, and it was so devised as to be deficient in the fat-soluble vitamins. The author summarizes her results as follows: 'A diet containing in abundance those articles with which the fat-soluble A accessory food factor is associated—e.g., cod-liver oil, butter, etc.—allows the development in puppies of sound teeth. A diet otherwise adequate but deficient in the substance with which fat-soluble A is associated brings about the following defects in puppies' teeth: (a) Delayed loss of deciduous

teeth. (b) Delayed eruption of the permanent dentition. (c) Irregularity in position and overlapping, especially of the incisors. (d) Partial absence of, or very defective, enamel. (e) Low calcium content.'

"Recently May Mellanby and Pattison have carried out a clinical study of some of the dietary factors which influence the spread of caries in children and conclude that 'those dietetic substances which have been found in animal experiments to produce perfect and imperfect teeth are also those which raise and lower, respectively, the resistance of erupted teeth to caries.' Milk, eggs, and cod-liver oil had a favorable action, and cereals (especially oatmeal) unfavorable action on the structure of the teeth.

"A similar but much less extensive investigation was carried out in rats by Grieves. He takes a different point of view and writes: 'It must not be concluded that diets which produce experimental rickets also induce caries-like lesions,' and that on a low-calcium and low-fat-soluble diet 'rachitic and caries-like lesions are rarely co-existent.' He stresses the importance of a proper 'calcium-phosphorus-organic factor balance in the dietary.' These investigations furnish an adequate idea of the present status of experimental research on caries of the teeth in relation to rickets. Although they are of decided value and show that hypoplasia can regularly be brought about by defective diets, they do not answer satisfactorily the question as to the main cause of the widespread dental caries. It is the general experience, of physicians as well as laymen, that carious teeth are to be found in children of the well-to-do and the wealthy, children who have had a liberal diet and who have never suffered from rickets. I have encountered many such instances, both in institutional and in private practice. Some of these had been given cod-liver oil throughout infancy. Indeed Hellman, who has studied this question with great care, writes that the 'dentures of the wealthy children show a normal percentage of 17.64 per cent, the poor as high as 59.51 per cent normal occlusion!'

"In a recent study of 'the physical status of the urban negro child,' carried out by Sterling of the U. S. Public Health Service, the teeth of 5,000 children between 6 and 14 years of age were examined in the schools of Atlanta, Georgia. It was found that 'the percentage of children free from dental caries in this negro group compares very favorably, according to various reports, with that among white children of the same economic status, and of even many of better social environment.'

"In this connection, it should be mentioned delayed dentition is associated especially with the form of rickets which is accompanied by slight degrees of hydrocephalus, as illustrated by the following case: S. G., admitted to the institution when aged about 4 months, weighed 4.25 kg. It showed beading and craniotabes in spite of the fact that it had been breast-fed. Its length was 58.8 cm., head circumference 39.2 cm. and chest 36.8 cm. At 6 months of age its head

was almost 4 cm. larger than the chest, at 8 months almost 6 cm. larger than the chest, at 10 months 5.5 cm., at 13 months 3.5 cm., and 18 months only 1.5 cm. It received cod-liver oil when somewhat over seven months of age, and soon thereafter showed signs of healing by the roentgen rays, as well as disappearance of craniotabes and of beading. The first tooth did not appear until 14 months, at which time the baby began to sit; at 18 months it had nine teeth. There are numerous clinical observations which cast doubt on the validity of ascribing dental caries to pre-existing rickets. For example, dental caries is very prevalent in Kingston, Jamaica, both among the white and the colored population. A few years ago, while visiting this island, I consulted several dentists in regard to the question and was told that caries was about as common in this city as in the cities of northern United States. One of the dentists whom I consulted had practiced for many years in Vermont. The people of this island are almost free from rickets as we should expect, considering the abundance of sunshine which they enjoy. I was able to find but slight signs of rickets among the babies in the hospital and in the welfare clinics of Jamaica. The diet of the people consists largely of fruit and vegetables, an indefinite amount of carbohydrates, and occasionally chicken, eggs, and milk. As mentioned above, the women of this region rarely present evidences of pelvic deformity.

"Before leaving this subject it should be mentioned that a causal relationship has been established experimentally between the parathyroids and dental defects. Erdheim extirpated the parathyroid glands in rats and induced lesions in the teeth similar to those which developed in rachitic rats—hypoplasia rather than caries. I shall have occasion to refer again to this investigation in connection with the pathogenesis of tetany and of osteomalacia. This observation may well be linked to that of Fleischmann who believed that tetany is associated with a susceptibility of the teeth to caries. It should be noted, however, that tetany often is not associated with dental decay and, of course, that marked caries is met with unassociated with any evidence of tetany.

"Although there is no doubt that faulty nutrition plays a role in dental caries, we do not know as yet how great a role it plays and, more particularly, what are the defects of the diet which lead to premature erosion of the teeth. One of the difficulties lies in the fact that there is no characteristic pathologic lesion of the teeth which is distinctive of rickets. In the long bones the diagnosis of rickets is established by the presence of osteoid tissue, of overgrowth of cartilage, etc., but in the teeth the criteria are simply hypoplasia and caries, which are not specific lesions but result from various factors, congenital, dietetic, hygienic. Another source of confusion lies in the fact that the observations on animals refer almost entirely to hypoplasia of the teeth, whereas the clinical phenomenon is mainly caries. These two pathological conditions may prove to be distinct from an etiological standpoint. It has been found impossible to induce caries

regularly in the dog or in the rat, and I understand that these animals rarely, if ever, develop carious teeth under normal conditions."

Shelling and Anderson[15] state, in a report on the relation of rickets and vitamin D to the incidence of dental caries, enamel hypoplasia, and malocclusion in children:

"While it is unquestionably true that for ossification to proceed normally, an abundance of lime salt and of vitamins is required, experimental evidence that a paucity of calcium, phosphorus or of the vitamins mentioned is the primary factor in the causation of dental caries is not conclusive.

"The deficiencies which are likely to cause dental decay are those already mentioned, namely, calcium, phosphorus and vitamins C and D.

"The material for the dental study was obtained from our clinic for the study of the effects of viosterol in the prevention and treatment of rickets. The subjects were divided into two groups. The first group (A) was comprised of 126 children demonstrated to have had active rickets by roentgen-ray examination of the bones and by chemical examination of the blood for calcium and inorganic phosphorus, and who were treated with vitamin D until the rachitic process in the bones entirely disappeared.

"The second group (B) consisted of 150 children who had received adequate amounts of vitamin D, in the form of viosterol in oil, in early childhood, and the roentgen-ray films of whose bones showed that they were completely protected against rickets. The average age of this group was 49 months, the oldest child being 7 years and 8 months.

"RESULTS. *Caries.*—The results of the examination for dental caries in the two groups are shown in Tables 2 and 3. From these tables, it is seen that the incidence of caries, with respect to percentage of cases, total caries and number of carious areas per child, was as great in the group that received vitamin D as in the group known to have had rickets in early infancy and childhood. The percentage of poor oral hygiene apparently bears no relation to the greater incidence of dental caries in one group than in another, since the oral hygiene was actually worse in the less susceptible group (52 per cent in group A as against 47 per cent in group B). For instance, of the twenty mouths showing the greatest number of carious areas, five were clean, ten were fairly clean and but five were dirty.

"*Enamel Hypoplasia.*—Of the 126 children examined in group A, fifty-five, or 43 per cent, presented evidence of either 'slight' or 'marked' hypoplasia of the deciduous teeth. Twenty-eight showed 'marked' and twenty-seven 'slight' hypoplasia. In addition, thirty-two gave evidence, on roentgenographic examination, that hypoplasia existed in the permanent teeth, but it was impossible to judge the degree of involvement. Eighty-seven children, or 69 per cent of the group, therefore, presented evidence of hypoplasia of the enamel of

TABLE 2.—INCIDENCE OF CARIES AND STATE OF ORAL HYGIENE IN THE TWO GROUPS

GROUP	TOTAL	WITH CARIES		TOTAL CARIES	HIGHEST NUMBER PER CHILD	AVERAGE PER CHILD	HYGIENE					
		NUMBER	PER CENT				CLEAN		DIRTY		FAIR	
							NUMBER	PER CENT	NUMBER	PER CENT	NUMBER	PER CENT
A	126	68*	54	385*	13†	5	55	44	21	17	44	36
B	150	89	58	667*	20†	7.5	80	53	24	16	46	30

TABLE 3.—DISTRIBUTION OF CARIES ACCORDING TO TEETH AND SURFACES INVOLVED

GROUP	TOTAL CASES	AVERAGE AGE MO.	TEETH INVOLVED	NUMBER INVOLVED	SURFACES							
					OCCLUSAL		MESIAL		DISTAL		BUCCAL	
					NUMBER	PER CENT	NUMBER	PER CENT	NUMBER	PER CENT	NUMBER	PER CENT
A	126	65	Deciduous	346*	192	55.4	73	21.1	70	20.4	8	2.3
			Permanent	39	35	89.7	4	10.0	--	--	--	--
B	150	48	Deciduous	648	282	43.0	165	24.0	189	29.0	12	0.2
			Permanent	19	14	2.0	1	0.5	--	--	--	--

*Each tooth surface was considered as a source of a single cavity; a cavity on the mesial, occlusal, and distal surfaces of a tooth would therefore be three cavities.

†Each of these mouths was hygienically "dirty."

either the deciduous or the permanent teeth, or both. Nine hundred and forty-two teeth out of a possible 3,024, or 31 per cent, were affected in varying degrees, 294, or 9.5 per cent, being permanent teeth, and 648, or 21.5 per cent, deciduous teeth. Fifteen children were found to have all twenty of the deciduous teeth hypoplastic in varying degrees; while thirteen others had at least twelve of the full complement of twenty deciduous teeth so affected.

"The study of enamel hypoplasia in group B was concerned with the examination of the coronal surfaces of the deciduous teeth, since the average age in this group of patients was a little more than 4 years, and hence only in very few had any permanent teeth erupted. The roentgenographic examination, while helpful in determining hypoplasia in the permanent teeth, is not entirely trustworthy, especially as regards the degree of involvement.

"Only sixteen patients, or approximately 10 per cent, were found to have hypoplastic permanent teeth, these all being first molars. Twenty-six, or 18 per cent, had hypoplastic deciduous teeth. Only three, or 2 per cent, of the 150 children examined, were classified as showing 'marked' and thirty-nine, or 26 per cent, as showing 'slight' hypoplasia; a total of forty-two, or 28 per cent. When individual teeth were considered, 223 deciduous molars of a possible 1200, or 19 per cent, were found to be affected in a greater or less degree.

"*Malocclusion.*—In group A, seventy-seven cases, or 61 per cent, were diagnosed as Class I malocclusion (Angle classification), which involves the mesiodistal or anteroposterior relation of the mandibular to the maxillary arch, as shown by the mesiobuccal cusp of the maxillary first molar fitting into the buccal groove of the mandibular first molar. There was malocclusion of the individual teeth in the entire group regardless of the relation of the arches.

"Six, or 4 per cent, presented Class II malocclusion, that is, the distal relation of the mandibular to the maxillary dental arch; and eleven, or 9 per cent, showed a Class III tendency, which is the mesial relation of the mandibular to the maxillary dental arch. Forty, or 31 per cent, possessed open-bites; and six, or 4 per cent, possessed overbites. Twenty-nine, or 24 per cent of the number examined, had protrusion of the maxillary teeth; eight of which, or 62 per cent, were due to thumb-sucking and other habits.

"In group B, sixty-eight, or 45 per cent, had malocclusion of one form or another in a greater or lesser degree. Forty-one, or 27 per cent of the number examined, showed Class I, and twenty-seven, or 18 per cent, presented Class II malocclusion. No Class III malocclusion was found in the entire group. A total of seventeen, or 11 per cent, had deep overbites, and ten, or 7 per cent, had open-bites. Protrusive types of malocclusion were found in thirty-seven patients, or 24 per cent; and of these fifteen, or 40 per cent, of the cases of protrusion, were due to bad habits."

"Summary. 1. Two hundred and seventy-six children were studied with respect to the incidence of dental caries, enamel hypoplasia, and

malocclusion. One hundred and twenty-six had roentgenographic evidence of rickets in infancy and early childhood, and 150 had received vitamin D as a prophylactic measure against rickets and, in these, the presence of the disease was ruled out by serial roentgen-ray films. In the first group, forty-two were over 6 years of age, and, in the second group, only twenty-seven were over this age.

"2. The incidence of dental caries in the rachitic group was not greater than in the group receiving vitamin D. The incidence was greater in the white than in the colored children regardless of the presence or absence of rickets during infancy. The lack of a preponderance of caries in the rachitic group may, therefore, have been due to the larger number of colored children in this group (93 per cent) as compared with 28 per cent in the nonrachitic group. The conditions that predispose white children against it are not clear.

"3. The findings do not prove that a relationship exists between rickets and dental caries or that vitamin D is protective against caries in the deciduous teeth.

"4. Enamel hypoplasia was found more often in children with a history of pre-existent rickets, but there was no definite relationship between hypoplasia and caries.

"5. Malocclusion, especially of Class I (Angle), was more common in rachitic children than in the non-rachitic group."

CONCLUSIONS

1. Rickets is induced most frequently by a deficiency of calcium, phosphorus, and vitamin D.

2. The disease is worldwide in its attack, but is seen most frequently in the temperate zones.

3. Negroes and Italians are most susceptible, with males and females equally affected.

4. The only constant and characteristic lesions of rickets are found in the bones.

5. Teeth are usually late in eruption, with that portion of the tooth affected having been laid down at the time of the onset of the disease. As a diagnostic aid of rickets, delayed dentition possesses little significance, however, owing to the variability in the time of eruption of deciduous teeth. Recent investigations have shown that caries and hypoplasia do not occur with any greater frequency in children who have had rickets than in children who have had antirachitic therapy. Recent investigations have shown malocclusion to be more frequent in children who have had rickets than in those who have not been affected.

6. Rickets can be prevented and can be cured by:

(a) employing vitamin D therapy
(b) exposure to sunlight
(c) the use of an ultraviolet ray lamp.

Vitamin D therapy is used almost exclusively for the prevention and cure of rickets.

7. Antirachitic agents in most common use are (a) fish liver oils, (b) irradiated sterols, and (c) vitamin D milks.

8. The use of antirachitic therapy should be begun at 3 to 4 months of age in full-term infants, and at 2 weeks of age in premature infants.

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EXTENDING THE SCOPE OF ORTHODONTICS

FRANK S. CARTWRIGHT, D.D.S., M.S., DETROIT, MICH.

Quo Vadis! Whither goest Thou!

TODAY, when this strange world of ours is in such a sad state of affairs, we may well pause to consider where we are all going, and why. That mighty forces for change are at work is very evident, not only in the field of government, but in the fields of religion, science, and human relations of all kinds. While volumes could be written and hours consumed in discussing the varied and apparently revolutionary trends of the times, it is our purpose here to confine ourselves to an intelligent consideration of the effects of some of these forces for change upon the practice of dentistry in general, and of orthodontics in particular, since a consideration of the latter touches most intimately the group here gathered together. What is our goal in dentistry—and more specifically—in orthodontics? And how are we, in this profession, going to cope with, and adjust to, the demands and pressures for change in the fields of both physical and mental health, in which fields it is my contention that the practice of orthodontics should play an important part?

Anyone familiar with recent bills presented in the United States Congress must be convinced, it seems to me, that there is going on in America today a complete health revolution, as well as a political and economic one. Pressure groups are demanding changes, and political leaders must take serious account of these demands or expect to lose both position and power of leadership. While we, as orthodontists, may not always be in accord with the demands made upon us, we should recognize conditions as they are, and be intensely alert to all social change, particularly as it affects the entire dental profession. Unless we succeed in evolving ways for acceptable health services voluntarily, others less appreciative of our problems will do it for us.

And since orthodontics is an integral part of dentistry, it can no longer afford to rest serenely aloof on a pedestal, as it has sometimes been accused of doing. In the face of new conditions, orthodontics will no longer be considered a luxury, and the orthodontic practitioner will no longer be able to just treat the rich and affluent. Malocclusion is a biologic variation very definitely and very generally associated with civilized man. A good portion of it seems to be produced by uncontrolled inter- and intrabreeding of many types and races, living in an environment which tends to increase the number of variations. The masses more than the classes are affected with it. If we recognize these facts, orthodontics need not materially suffer during this period of political and social upheaval. We can control its evolution if we will only make a slight effort.

Before considering the avenues by which we can extend our services, we orthodontists might well consider the exact status of orthodontics. Is it a trade? Is it a part of medical procedure? We all concede that it is a field of dentistry. By the following deductive reasoning, it seems to me that we must come

Delivered at The Scrod Club of Boston at Great Barrington, Mass., on June 24, 1940.

to the conclusion that orthodontics, like dentistry, is also a branch of medical procedure. Medicine considers the science of eye correction comparable to the science of bone correction. Ophthalmology and orthopedics are concerned with the adjustment of the organism as a unit. Now the chief purpose of orthodontics is to assist nature in the development of the structural elements of the jaws and so produce an harmonious relationship between the supporting and surrounding structures of the teeth that will better enable the individual to enjoy maximum functional activity, that is, the adjustment of the organism as a unit. Since things comparable to the same things are comparable to each other, it must then follow that the science of orthodontics is comparable to these two other medical sciences. This being so, I believe that orthodontics will some day take its just place in all health-giving institutions.

In the past, hospitals have been considered places for treating diseases and for performing surgical operations. The hospitals of the future will employ staffs for rendering complete diagnosis, plus treatment and surgical operations. There are already a few such hospitals in the United States. The Henry Ford Hospital is one of them. It offers diagnosis, treatment and surgical procedure in practically all fields of health service. Its staff is composed of all full-time salaried medical and dental practitioners. The staff members never discuss fees with the patient. Their considerations are always purely professional. The patients come from all walks of life.

On Nov. 1, 1934, the Henry Ford Hospital established a Division of Orthodontics within its dental department. This, I believe, is the first hospital in the world to employ on its staff a full-time salaried orthodontist. The division came into being because of the demand for its service, together with the fact that many of the students in Ford's then recently founded Greenfield Village Schools (all of whom receive complete free medical and dental attention) were in urgent need of orthodontic treatment.

To the dental educator and to the farsighted orthodontist this was advancing the scope of orthodontics, but to many practitioners of dentistry and orthodontics, it appeared to be just another encroachment upon the rights of individual practice. Personally, I believe that hospital practice of orthodontics should give one a broader concept of health problems and a better opportunity to practice safe and sane orthodontics.

I believe that more men have come to appreciate the necessity for all forms of dentistry in any large, health-giving institution. Most new hospitals have placed general dentists on their staffs, and many of the older institutions are now doing so. In a few states it is now being suggested that dentists serve an internship before a license is granted. Hospitals would be an ideal place in which to serve such internships.

Bearing in mind that any superficial interpretation of orthodontics must lead to failure in prognosis, it would seem that where a division of orthodontics existed in a hospital, the dental graduate, while serving an internship in such an institution, could certainly widen his scope of knowledge concerning the problems of growth and development of the child, and thus avoid such superficiality.

Having a qualified orthodontist on the staff of a hospital also helps to round out that institution's diagnostic field. J. Pierce Anthony, in a recent

editorial in the *Journal of the American Dental Association*, entitled "Responsibility for Diagnosis," says: "The cardinal principle of the successful treatment of disease is an accurate knowledge of the cause and nature of the particular disease on the part of the one who undertakes to treat it, and the practitioner of any phase of the healing art is definitely obligated, morally and legally, to exert every effort in the application of all the knowledge gained in his professional education and later experience, to arrive at a correct diagnosis on any and every ill that he undertakes to cure."

Granting that this is true, it is also unfortunately true that some orthodontists today place more emphasis on mechanics than on diagnosis. Generally speaking, altogether too many dentists practice just as they did twenty to twenty-five years ago. Some orthodontists still base prognosis on the old "arch predetermination theory." About arch predetermination Dr. A. LeRoy Johnson, in "The Basic Principles of Orthodontics," says: "Predeterminism, it seems to me, is a contradiction of the epigenetic conception of development. When we remember that an organism is so complex that prediction of causal relation is not yet possible, I think we should pause and question well before accepting the promise of the absolute held out to us by the predeterminist."

But dental schools until very recently have done little to instill a broader concept of orthodontics. In this connection I quote the following from the paper by Dr. Wm. W. Woodbury, entitled "The Trend of Orthodontic Teaching and Investigation as a Primary Dental Concern," which appeared in the February, 1940, issue of the AMERICAN JOURNAL OF ORTHODONTICS AND ORAL SURGERY: "Regarding recent trends in orthodontic teaching a logical starting point would appear to be the Report of the Curriculum Survey Committee of the American Association of Dental Schools published in 1935. At the 1936 meeting of the Association a group conference was devoted to orthodontics at which a symposium on teaching was given and a report presented setting forth the reception accorded the section on orthodontics by teachers of this subject. From a study of this report one gathers that over 60 per cent of the schools had indicated that they had accepted, or were about to accept, the findings of the Curriculum Survey Committee and were making this the basis of their instruction. If this is a fair picture of the condition existing three years ago, it is probably safe to conclude that it has not altered materially in the interim. It was pointed out at that time that the Survey Report urged that students be counselled to undertake only the treatment of simple cases. "Now there are simple cases which are easy to treat," as one teacher said, "but to recognize them with any degree of certainty is quite another matter. This often requires extensive knowledge which is many times beyond that possessed by even specialists"; so he continued, "Since we are often deceived by what appears to be a simple case, we do not feel that we are justified in presuming to teach undergraduate students along these lines. Otherwise, the student is certain to acquire overconfidence and do much damage. On the other hand, the general practitioner has the opportunity of doing a great deal of orthodontics without using appliances." It was further shown that while many of the objectives of teaching as set forth by the Report were acceptable, the actual curriculum suggested tended to defeat them. For example it was stated that the object of the course was, among other things, to teach the student to understand the biologic aspects

of malocclusion and to diagnose cases of malocclusion, but an analysis of the proposed curriculum showed that the student would receive "a very heavy dose of appliances both in class and in the laboratory before he knows what the central problem of orthodontics is. It will not be surprising if he concludes that the central problem of orthodontics is the making and manipulating of appliances for the movement of teeth." The ability of the student to diagnose a case of malocclusion had apparently received attention in the Survey Report as an afterthought rather than a central consideration, for it is stated in the section on Clinical Dentistry that, "Data were not obtained regarding the participation of the students in the diagnosis of cases."

Orthodontic lecturers, as in days of old, still draw larger crowds when they talk about the virtues of one appliance over another than when they discuss the biologic phenomena of living matter. It is true, of course, that the combined qualities of a good teacher, researcher and practitioner rarely exist in one person. Some of us are born teachers, a few are researchers, but the majority of us are practitioners. As good practitioners, however, we should attempt to coordinate new teachings and new research findings with our own clinical findings. Recognition of fundamental biologic problems must be a part of orthodontic diagnosis. Mechanical procedure is important, but of secondary consideration. Orthodontic treatment need not always involve the construction of complicated mechanical apparatus. Suggestions concerning the correction of faulty habits, judicious extraction, the retention and the grinding of interproximal surfaces of deciduous teeth, together with the recognition of normal dentition and arch development should be a part of modern orthodontic procedure. With sound knowledge concerning normal tooth eruption and arch development, one cannot but observe more cases. Some orthodontists, either because of faulty education, lack of knowledge, or economic pressure, fail to observe enough cases.

Perhaps for the same reasons there are still some orthodontists who prolong treatment unnecessarily. Treatment time could be shortened in numerous instances if cases were correctly diagnosed, if simplified techniques were used, and if a better method of scheduling appointments were employed. Instead of having appointments spread out through the entire day, present methods, in many practices, simply expose ten or fifteen children to orthodontic gestures after school, accomplishing little or nothing at each visit.

It is quite possible that some of the reason for extensive treatment is due to the fact that our public schools do not offer enough aid in having the child keep an appropriate appointment. In the state of California, on June 9, 1939, a law was passed, the text of which reads as follows: "No absence of a pupil from school for the purpose of having dental services rendered shall be deemed an absence in computing the average daily attendance." It took four years of struggle against the opposition of the State Department of Education before this law was passed. Regarding this law, H. C. Pollock wrote, in an editorial in the December, 1939, issue of the AMERICAN JOURNAL OF ORTHODONTICS AND ORAL SURGERY, as follows: "Men practicing dentistry and medicine everywhere hope that the time is not remote when each and every state in America will enjoy like legislation, so that the children will not suffer the penalty of slapstick and hurried service." If more hours were available to orthodontists, more

children could be cared for and thus the scope of orthodontics be further extended. Every dental and medical organization should petition their state legislature for a law similar to that passed in California, and thus help to extend better health service.

The close relationship of orthodontics to other dental and medical specialties should not be underestimated. The correction of a pronounced maxillary or mandibular protrusion may aid the psychologist in the handling of certain behavior problems in a particular child. This same correction may help the pediatrician solve some of the digestive upsets found in children. The problems associated with growth and development of children are mutual problems of the pediatrician and the orthodontist. Clinical cooperation might further the solution of them.

If hospitals of the future continue to elevate diagnostic procedure, orthodontics should not be overlooked. By having an orthodontist on the staff, many of the specialties can be aided in making a more complete diagnosis. The plastic surgeon, as well as the oral surgeon, can be aided by an orthodontist. The relationship has been somewhat neglected, partly because the cases involved offered little financial remuneration, and partly because the orthodontist has made little or no attempt to cooperate. Orthodontic appliances can be made to aid the healing of fractures of the jaw. Simplified arch wires and bands, judiciously placed at the time of setting of certain fractures, are less bulky than many of the heavy ligatures which have been in use in the past. The mouth can be kept cleaner and the approximated fragments can often be held more firmly together by the use of such simplified orthodontic devices. Cleft palate and harelip cases, both before and after surgery, can be helped by judicious orthodontics.

In conclusion, the professional man should be nothing less than a continuous student. With study we arrive at truth. Every new angle of approach for diagnosis is an aid to better health service. Every orthodontist, if his education is fundamentally correct and founded upon biologic as well as mechanical concepts, can do his part to elevate the science of orthodontics. Hospital associations of dentistry should tend to keep both the medical and dental professions better related concerning each other's problems. Through mutual cooperation will come about better understanding. Through better understanding, both the professions and the public will benefit.

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Department of Orthodontic Abstracts and Reviews

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Finger, Thumb, Lip and Tongue Sucking: By Guttorm Toverud, *Den Norske Tannlaegeforenings Tidende* **50**: 214-229, 1940.

If the habit is broken between the ages of three and four the correction of protrusion of the maxillary anterior teeth will take place by itself. If the habit is continued for even two years more, self-correction becomes less, almost impossible.

Why does the child suck the finger? Freud says it is a sexual impulse. Langford gives different explanations and divides sucking into three periods, babies, small children, and older. In sucking babies he attributes it to not enough food. In small children 4 to 10 months it is the period when everything goes into the mouth. The child begins to study his surroundings. In older children, those who are over 5 years, one has to look for other reasons. In this case it is very often maladjustment of physical or social manifestations. The habit here is a symptom of the complexes in the child.

Levy thinks the child takes the food too quickly from breast or bottle. The bottle or breast is taken away from the child before he is finished. Changing of meal time, he states that the baby, if he has had enough food, falls asleep at once, if not he will suck the finger until he is overcome by sleep. If this happens after every meal the habit can easily become permanent.

Finger-sucking in the 2-, 3-, or 4-year old has different reasons. It may be attributed to tiredness, carelessness, boredom, or after scolding or punishment. The third year of the child is the typical *No* or *Will Not* period. One should try to overcome these conflicts with the child and his surroundings. If the finger is taken away by force from the mouth, the child will try his utmost to succeed by putting it back and usually is the winner. The habit is formed stronger than ever, according to Levy.

The breaking of the habit of lip- or thumb-sucking is harder to eliminate than the finger-sucking; usually this will have to be corrected with appliances. The following is presented as a guide to treatment:

1. In babies, sucking is the physiologic urge and therefore not much attention need be paid to it.

2. Sucking in 2-, 3-, or 4-year-old children is a continuance from the baby habit and has its root either in a nervous or psychologic action.

3. The habit will have bad results in jaw formation when continued past early childhood, and can therefore produce serious psychologic and physiologic defects.

4. If the habit is broken early, the anomaly of the anterior maxilla may reduce itself and in time become normal. If the habit is not broken at the age of 5 or 6 one can be sure that there is very little chance of self-correction.

5. If the habit is not broken after the first year, mechanical remedies should be considered; oral treatment should only be used in later years.

6. Experience has shown that direct local treatment applied early in life is effective without psychologic damage to the child later on.

7. In psychopathic children local treatment will not be effective unless given in connection with general psychotherapy.

Erna Guttenstein, D.D.S.

Orthodontic Treatment of Adult Patients (Om Kjeveortopedisk Behandling Av Voksne Patienter): By Kaare Reitan, *Den Norske Tannluegeforenings Tidende* **51**: 41-62, February, 1941.

While in the child one may expand the dental arch by using mechanical appliances and in this way stimulate growth and development of the osseous structures of the jaw, a similar rapid growth of the bone does not take place in the adult because growth and phosphatase activity have entered into a more static period. This may, in a case of expansion, manifest itself as a predominance in bone resorption. The result is more or less a diminishing of the labial or buccal alveolar crest, and a lack of compensatory bone growth.

In the adult, the physiologic wandering of the teeth is mainly limited to a tooth movement in mesial or distal direction. The author is of the opinion that it would be natural, when treating adults, to move the teeth in these same directions and rather avoid expansion of the dental arch in the first place. For such individual tooth movement fixed appliances may be employed.

Andresen has clinically shown that expansion of the jaws in adults is possible, provided a functional apparatus, the activator, is used.

The individual tooth movements being accomplished, one may, during a second period of treatment, expand the jaw or adjust the position of the teeth, by using an activator (a removable appliance which stimulates growth). This plan of treatment, which is the reverse of the one used in younger patients, has proved favorable in cases of extreme contraction of the maxilla. Such cases are often complicated by mesial drift of the buccal segments. On account of this, one has to extract teeth in order to procure sufficient space.

Conclusions may be summarized as follows:

1. Malocclusion in adult patients often has as an etiologic factor, mesial drift of buccal segments after eruption of the second and third molars.

2. While in the child the physiologic tooth movement and tissue changes may be regarded as processes of growth, in the adult they are to a great extent an expression of changes caused by the function of the masticatory apparatus.

3. The physiologic wandering of the teeth in the adult is mainly limited to a tooth movement in mesial or distal direction and treatment with mechanical

appliances should preferably be conducted in accordance with this conception. In the adult, expansion of the dental arch by mechanical means should be carried out carefully and slowly in order to avoid relapse and resorptive destruction of the labial or buccal bone crests.

4. Individual tooth movement in labial or lingual direction by means of mechanical appliances may be performed with less danger of relapse, provided this change in position of the teeth brings them in a more favorable relation as far as function is concerned.

5. Relapses occurring a longer period after the treatment is finished, are less frequent than in children, because the adult is beyond the period of maximal growth.

Editorial

The New Editorial Board

In the January, 1915, Vol. I, No. I issue of the JOURNAL appears an editorial written by the first editor-in-chief.

In outlining the purpose of the new journal at that time the late Martin Dewey wrote as follows: "The INTERNATIONAL JOURNAL OF ORTHODONTIA will endeavor to serve society by arousing interest in this much-needed and fascinating branch of science. It offers its pages to workers in this field with the hope that it may benefit humanity, that it may help to increase human efficiency, and that it may become a factor in arousing interest in child life to such an extent that malocclusion be given as much attention as is now bestowed by school inspectors upon adenoids, eyestrain, and mental defects."

Since the above excerpt from the first editorial of the JOURNAL was written, the AMERICAN JOURNAL OF ORTHODONTICS AND ORAL SURGERY has published the official proceedings of the American Association of Orthodontists for a period of nearly twenty-five years. During this time there has been recorded one of the richest and most complete scientific printed records of any department in the field of dentistry. More profuse is the compiled literature of orthodontics than that of many of the departments of even scientific medicine. Added to this compilation there have been recorded the proceedings of the majority of the various district orthodontic societies. This record has been made possible not only through the loyal cooperation of the various orthodontic societies and individual authors but has been a result as well, in no small measure, of the valuable assistance and counsel of its associate editors. As a group they have manifest a highly cooperative attitude toward the whole purpose of creating a creditable and complete record of orthodontic literature.

It can be safely said by the editors who have been in charge of the publications of the JOURNAL since its inception that the editors of no scientific journal have enjoyed more constructive and fraternal support of their coworkers than have those of this journal in the past. "Serve orthodontics as a constructive and creative influence for its advancement." That has been the only adamant order received by the editors from the publishers in all of these years. Even so the JOURNAL has not been without opposition during its career; notwithstanding it is interesting that practically all opposition either direct or indirect has originated from without the orthodontic specialty itself—therefore unimportant to the purpose in hand.

Now it comes about that through the cooperation of the Publication Committee of the American Association of Orthodontists, the publishers, and editors of the AMERICAN JOURNAL OF ORTHODONTICS AND ORAL SURGERY, an arrangement has been completed wherein it is thought that the various orthodontic societies collectively and individually may be better served by a plan wherein each component society be directed to elect from its own membership by ballot an associate editor to represent that society on the editorial board of the JOURNAL.

It has been agreed that such an editor after having been chosen by his own group must be approved by both the Board of Directors of the American Association of Orthodontists and the publishers of the JOURNAL. Accordingly acting upon that premise the Board of Directors of the American Association of Orthodontists in formal session in New York City in May approved all of the associate editors who had been previously elected by the various component societies, according to the above plan as outlined in Chicago in 1940.

In the June issue of the JOURNAL there appears the list of associate editors as approved in New York in May by the American Association of Orthodontists who will contribute their share in directing the policy of the JOURNAL in the future. The editors and publishers express their gratitude for the able assistance and constructive influence that has been unselfishly contributed by the former editorial board who have served without gratuity or hope of reward. A welcome is extended the new board in full confidence that the JOURNAL may receive the same unselfish support that it has enjoyed in the past, and to the end that a literature may continue to be recorded for the orthodontic specialty that will be a source of pride not only for the present workers but for generations of workers in this field yet to come.

H. C. P.

Erratum

In the editorial in the June, 1941, issue of the Journal, page 344, the third paragraph should be changed to read:

"Officers selected to pilot the organization for the following year were Claude R. Wood, Knoxville, Tenn., President; J. A. Burrill, Chicago, Ill., President-Elect; Milo Hellman, New York, N. Y., Vice-President; Max E. Ernst, St. Paul, Minn., Secretary-Treasurer."

News and Notes

Public Relations Bureau Meeting

A meeting of the public relations bureau of the American Association of Orthodontists was held at the Lexington Hotel, New York City, May 6, 1941. The purpose of the meeting was to hear reports from members and interested orthodontists from distant points in the country, pertaining to the activities of the bureau.

An invitation to attend the luncheon was extended to the general session of the A. A. O. and thirty-seven people were present, members of the Board of Directors, members of the Executive Committee, and some interested in the work.

No set form of procedure was followed, but the following made interesting reports generally complimentary to the work and all instructive for future procedure: Reese of Los Angeles, Calif.; Gibbin of Buffalo, N. Y.; Robison of Hutchinson, Kansas; Broussard of New Orleans, La.; Grieve of Toronto, Canada; Lussier of San Francisco, Calif.; Noyes of Chicago, Ill.; Riesner of New York; Pollock of St. Louis; Mr. Bishop of Washington, D. C.; and Mr. Anderson.

After reports had been heard and discussed Mr. Anderson introduced Mr. Bishop, who is in charge of the Nation Dental Hygiene Association of Washington, D. C., and whose program of dental hygiene under a grant from the Martha Hall Foundation was outlined in great detail. This was a comprehensive report, and it was well received.

Orthodontists present were:

W. D. Johnston	New Haven, Conn.
Herman Weinstein	Woodmere, N. Y.
C. M. Larson	Brooklyn, N. Y.
Earl F. Lussier	San Francisco, Calif.
Samuel Herder	New York City
Fred Wolfsohn	San Francisco, Calif.
Ben L. Reese	Los Angeles, Calif.
Floyd E. Gibbin	Buffalo, N. Y.
Lester H. Tate	Canton, Ohio
Verl F. Amend	Ellinwood, Kan.
Paul Hoffman	Washington, D. C.
Wm. Weichselbaum, Jr.	Savannah, Ga.
Clifford G. Glaser	Buffalo, N. Y.
Wilson R. Flint	Pittsburgh, Pa.
Max E. Ernst	St. Paul, Minn.
Charles F. Mitchell	Springfield, Mass.
Oscar Carrabine	New York City
H. C. Pollock	St. Louis, Mo.
Francis M. Schneider	New Haven, Conn.
Arthur L. Fern	Hartford, Conn.
Henry C. Beebe	Boston, Mass.
Albert A. MacDougal	Bangor, Me.
Franklin A. Squires	White Plains, N. Y.
J. A. Salzmann	New York City
Sidney E. Riesner	New York City
J. Elliott Dunn	San Francisco, Calif.
Harold J. Noyes	Chicago, Ill.
A. C. Broussard	New Orleans, La.
George W. Grieve	Toronto, Can.
G. F. Young	New York City

E. V. Snyder	Milwaukee, Wis.
M. C. Alkon	Boston, Mass.
Homer B. Robison	Hutchinson, Kan.
F. Nicolai	Brooklyn, N. Y.
D. Anderson	New York City
R. G. Bishop (National Dental Hygiene Assn.)	Washington, D. C.
N. L. Hillyer	New York City

Mayor La Guardia Urges Predraft Dental Care

In a recent article written for the *New York Times*, Mayor F. A. La Guardia of New York City discussed methods of reducing the high percentage of rejection of draftees and spoke of dental needs as follows:

"For instance, 6.63 per cent are now being rejected for defective or deficient teeth. Just think of that. A common-sense administration of the law, and I do not believe any amendment is required, will provide proper dental treatment at very little cost per man and would eliminate almost entirely all these rejections."

To our knowledge the percentage of rejections for dental causes in the New York Metropolitan district is over 23 per cent and not 6.63 per cent. However, it is encouraging to know that Mayor La Guardia is fully aware of the dental needs of the predraft age group. It is to be hoped that he will extend this interest to the public school children beyond the 4B grade and to high school boys and girls, from which group the future draftees are to come. (*New York J. Dent.* **11**: 245, 1941.)

Public Relations Bureau

According to the recent transaction of the Public Relations Bureau of the A. A. O., permission has been granted to representatives of the University of Mexico to translate some of the pamphlets on the subject of orthodontics into Spanish for distribution in Mexico. Also transcriptions have been made of two radio talks at the recent meeting of the A. A. O. in New York. A plan is being prepared to make these records available for re-broadcast anywhere in the country by local groups of orthodontists.

Mexican Association of Orthodontists

The third medico-dental convention organized by the Mexican Association of Orthodontists, was held June 23 to 28, 1941, at the National University of Mexico, in Mexico City, D. F. Guests from the United States whose names appeared on the program were Claude R. Wood, president of the American Association of Orthodontists; Dr. Oren A. Oliver, president-elect of the American Dental Association; Dr. S. R. Atkinson, honorary president of the Mexican Association of Orthodontists; Dr. Ralph Waldron, Newark, N. J.; and Dr. Hermann Becks, of the University of California.

The president of the Mexican Association of Orthodontists is Dr. Carlos M. Paz, and the secretary is Dr. Samuel Fastlicht. The address of the secretary of the association is Madero 40, Desp 102, Mexico, D. F.

Great Lakes Society of Orthodontists

The Great Lakes Society of Orthodontists will meet in Ann Arbor, Mich., Nov. 3 and 4, 1941.

Midcontinent Dental Congress

The Midcontinent Dental Congress will meet in St. Louis, Mo., Nov. 17, 18, and 19, 1941.

Southern Society of Orthodontists

The next meeting of the Southern Society of Orthodontists will be held in Raleigh, N. C., Sept. 29 and 30, 1941.

Note of Interest

Dr. Angus Francis White announces the removal of his office to 291 Whitney Avenue, New Haven, Conn., for the continued exclusive practice of orthodontics.

Selective Service Rejections

A recent article in the bulletin *Public Health Reports* published by the United States Public Health Service* contains some interesting tables on causes of physical disqualification under the Selective Service Law for all examinations made up to Feb. 1. Because of the importance of dental defects in these rejections, these official figures are of great interest to the dental profession.

TABLE I

PERCENTAGE OF EXAMINED MEN CLASSIFIED AS NOT QUALIFIED FOR ANY MILITARY SERVICE OR AS QUALIFIED FOR LIMITED SERVICE ONLY UNDER THE SELECTIVE SERVICE ACT OF 1940,[1] ACCORDING TO CAUSE

DISEASES[2]	PERCENTAGE OF EXAMINED MEN CLASSIFIED AS		
	NOT QUALIFIED FOR GENERAL MILITARY SERVICE[3] (CLASSES IV-F & I-B)	NOT QUALIFIED FOR ANY MILITARY SERVICE (CLASS IV-F)	QUALIFIED FOR LIMITED SERVICE ONLY (CLASS I-B)
All	42.68	27.92	14.76
Defective or deficient teeth	8.32	4.33	3.99
Eye diseases	5.03	2.51	2.53
Diseases of the cardiovascular system	3.69	3.02	0.67
Musculo-skeletal diseases	3.17	2.11	1.07
Nervous and mental diseases	2.95	2.54	0.41
Ear, nose, throat diseases	2.39	1.77	0.61
Hernia	2.02	0.93	1.10
Diseases of the respiratory system	1.71	1.33	0.39
Venereal diseases	1.62	1.02	0.60
Foot diseases	1.42	0.77	0.65
Overweight and underweight	1.37	0.75	0.62
Diseases of the genitourinary system	1.08	0.72	0.36
Endocrine disturbances	0.58	0.49	0.10
Varicose veins	0.48	0.34	0.14
Mouth and gum diseases	0.39	0.30	0.094
Skin diseases	0.31	0.23	0.079
Diseases of abdominal viscera	0.31	0.23	0.082
Hemorrhoids	0.22	0.12	0.10
Underheight	0.10	0.10	0.004
Other specified diseases	0.58	0.44	0.14
Generally unfit	2.83	1.80	1.03
Obviously defective[4]	2.06	2.06	----

[1]These data are a combination of local board and induction center examinations. See text for description of how the rates were obtained.

[2]The term "disease" is used to mean disease, defects or impairments. Data are classified by primary cause.

[3]Sum of second and third columns.

[4]Classified by local boards as obviously defective without medical examination.

In commenting on the figures revealed by these tables Britten and Perrott state, "The fact that 8 per cent of all examined men, largely in the ages from 21 to 25, are being classified as not available for general military service by reason of tooth defects is a cause for serious

*Causes of Physical Disqualification under the Selective Service Law. Early Indications. By Rollo H. Britten, Sr. Statistician & George St. J. Perrott, Chief, Div. of Public Health Methods, National Institute of Health, United States Public Health Service. May 9, 1941.

TABLE II

PERCENTAGE DISTRIBUTION OF (A) MEN NOT QUALIFIED FOR ANY MILITARY SERVICE ACCORDING TO CAUSE AND (B) MEN QUALIFIED FOR LIMITED MILITARY SERVICE ONLY, ACCORDING TO CAUSE[1]

DISEASES[2]	PERCENTAGE DISTRIBUTION	
	NOT QUALIFIED FOR ANY MILITARY SERVICE (CLASS IV-F)	QUALIFIED FOR LIMITED SERVICE ONLY (CLASS I-B)
All	100.00	100.00
Defective or deficient teeth	15.51	27.03
Eye diseases	8.99	17.03
Diseases of the cardiovascular system	10.82	4.54
Musculo-skeletal diseases	7.56	7.25
Nervous and mental diseases	9.10	2.78
Ear, nose, throat diseases	6.34	4.13
Hernia	3.33	7.45
Diseases of the respiratory system	4.76	2.64
Venereal diseases	3.65	4.07
Foot diseases	2.76	4.40
Overweight and underweight	2.69	4.20
Diseases of the genitourinary system	2.58	2.44
Endocrine disturbances	1.76	0.68
Varicose veins	1.22	0.95
Mouth and gum diseases	1.07	0.64
Skin diseases	0.82	0.54
Diseases of abdominal viscera	0.82	0.56
Hemorrhoids	0.43	0.68
Underheight	0.36	0.027
Other specified diseases	1.58	0.95
Generally unfit	6.45	6.98
Obviously defective[3]	7.38	----

[1]These data are a combination of local board and induction center examinations. See text for description of how the rates were obtained.

[2]The term "disease" is used to mean disease, defects, or impairments. Data are classified by primary cause.

[3]Classified by local boards as obviously defective without medical examination.

concern and points to the need for more extended dental care. Next in order of frequency are eye defects and diseases (mostly defective vision). Consideration of the other groups will reveal many which are made up largely of remediable conditions. The correction of defects among youth must be regarded as of importance not only from the point of view of military man power, but also from that of industrial man power and public health generally. Furthermore, over and above the need for remedial care which these figures show is the realization that many of the impairments could have been prevented by more extended public health programs during the period of growth of these individuals. This fact emphasizes the need for further development of such programs in the future."

OFFICERS OF ORTHODONTIC SOCIETIES*

American Association of Orthodontists

President, Claude R. Wood - - - - - - - - 608 Medical Arts Bldg., Knoxville, Tenn.
Secretary-Treasurer, Max E. Ernst - - - 1250 Lowry Medical Arts Bldg., St. Paul, Minn.
Public Relations Bureau Director, Dwight Anderson
- - - - - - - - - - - - - - - - - 292 Madison Ave., New York, N. Y.

Central Association of Orthodontists

President, Harold J. Noyes - - - - - - - - - 55 E. Washington St., Chicago, Ill.
Secretary-Treasurer, L. B. Higley - - - - - - - 705 Summit Ave., Iowa City, Iowa

Great Lakes Society of Orthodontists

President, Frank S. Cartwright - - - - - - - Henry Ford Hospital, Detroit, Mich.
Secretary-Treasurer, Richard E. Barnes----------838 Keith Bldg., Cleveland, Ohio

Harvard Society of Orthodontists

President, Harold Nice - - - - - - - - - - 475 Commonwealth Ave., Boston, Mass.
Secretary-Treasurer, Edward I. Silver - - - - - - - - 80 Boylston St., Boston, Mass.

New York Society of Orthodontists

President, Glenn F. Young - - - - - - - - - 745 Fifth Ave., New York, N. Y.
Secretary-Treasurer, William C. Keller - - - - 40 E. Forty-Ninth St., New York, N. Y.

Pacific Coast Society of Orthodontists

President, Ben L. Reese - - - - - - - - - - Roosevelt Bldg., Los Angeles, Calif.
Secretary-Treasurer, Earl F. Lussier - - - - - 450 Sutter St., San Francisco, Calif.

Rocky Mountain Society of Orthodontists

President, A. B. Brusse - - - - - - - - - - 1558 Humboldt St., Denver, Colo.
Secretary-Treasurer, Robert L. Gray - - - - - - - - Republic Bldg., Denver, Colo.

Southern Society of Orthodontists

President, Fred G. Hale - - - - - - - - - - Professional Bldg., Raleigh, N. C.
Secretary-Treasurer, T. C. Sparks - - - - - - 1508 Washington St., Columbia, S. C.

Southwestern Society of Orthodontists

President, E. Forris Woodring - - - - - - - - - Medical Arts Bldg., Tulsa, Okla.
Secretary-Treasurer, R. E. Olson - - - - - - Union Nat'l Bank Bldg., Wichita, Kan.

Washington-Baltimore Society of Orthodontists

President, Paul W. Hoffman - - - - - - - - 1835 Eye St., N. W., Washington, D. C.
Secretary-Treasurer, Stephen C. Hopkins - - - - - 1726 Eye St., Washington, D. C.

American Board of Orthodontics

President, Charles R. Baker - - - - - - - - - - 636 Church St., Evanston, Ill.
Vice-President, Frederic T. Murlless, Jr. - - - - - 43 Farmington Ave., Hartford, Conn.
Secretary, Bernard G. DeVries - - - - - - - - Medical Arts Bldg., Minneapolis, Minn.
Treasurer, Oliver W. White - - - - - - - - 213 David Whitney Bldg., Detroit, Mich.
William E. Flesher - - - - - 806 Medical Arts Bldg., Oklahoma City, Okla.
James D. McCoy - - - - - - - - 3839 Wilshire Blvd., Los Angeles, Calif.
Joseph D. Eby - - - - - - - - - - 121 E. 60th St., New York, N. Y.

Foreign Societies†

British Society for the Study of Orthodontics

***President*, S. A. Riddett**
***Secretary*, R. Cutler**
***Treasurer*, Harold Chapman**

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*The Journal will make changes or additions to the above list when notified by the secretary-treasurer of the various societies. In the event societies desire more complete publication of the names of officers, this will be done upon receipt of the names from the secretary-treasurer.

†The Journal will publish the names of the president and secretary-treasurer of foreign orthodontic societies if the information is sent direct to the editor, 8022 Forsythe, St. Louis, Mo., U. S. A.

The 1904 Class of the Angle School of Orthodontia, St. Louis, Mo. *1*, Moritz Pflueger. *2*, Rene Enema. *3*, Jose Rojo. *4*, Jane G. Bunker. *5*, William A. Gunn. *6*, Ernest W. Vickers. *7*, Fred B. Noyes. *8*, A. H. Thompson. *9*, E. H. Wuerpel. *10*, E. H. Angle. *11*, Richard Summa. *12*, J. Lowe Young. *13*, Walter H. Ellis. *14*, Watkin W. Morris. *15*, Dana J. Edmonds. *16*, Louis P. Bethel. *17*, James J. Mount. *18*, Charles A. Hawley. (Courtesy of Dr. B. W. Weinberger, New York, N. Y.)